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Contractors and Engineers Monthly

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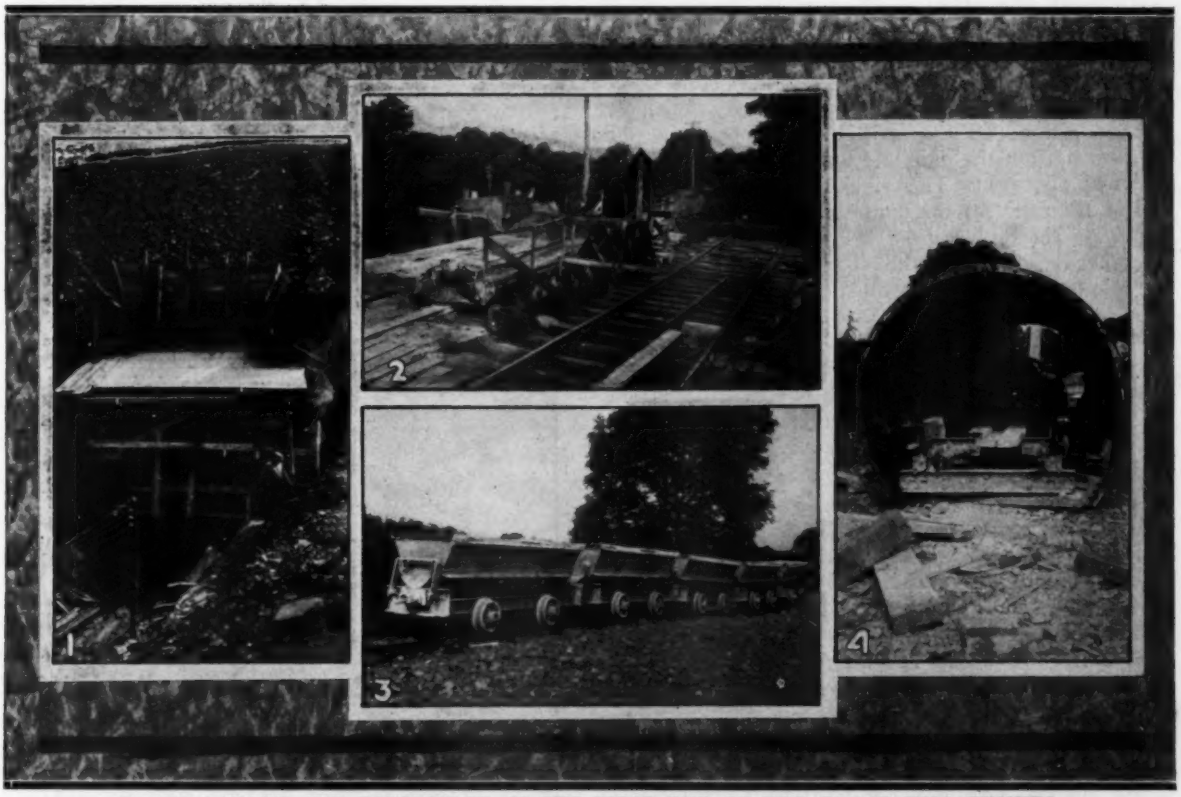
An Extensive Water Works Project

New Haven Water Company Building Dams, Dyke and Tunnels to Increase Supply

AN extensive construction program was begun by the New Haven Water Co., New Haven, Conn., in 1925, to develop a large addition to its water supply. This development lies about 8 miles northeast of New Haven and consists of bringing into one large storage reservoir a number of small streams which, in the aggregate, cover about 53 square miles of watershed area. The additional supply from the completed development will furnish about 40,000,000 gallons of water per day.

Totoket Dam and Reservoir

The Totoket reservoir is the main storage basin of the development. It is created by the Totoket Dam built in 1926 and 1927 and the East Dyke which will be completed before the end of the 1928 construction season. The Totoket Reservoir already impounds over a billion gallons of water with the flow line held below elevation 125, to make possible the completion of the



PLANT LAYOUT AND EQUIPMENT AT THE WEST END OF THE GREAT HILL TUNNEL

1. The concreting plant on the face of the hill. 2. Platform at top of concreting plant with cement house at right of rails, cement and lime chute at center, and sand and rock chute at left center. 3. Special concrete cars built for work in the Great Hill Tunnel. 4. Section of Blaw-Knox steel forms for tunnel, showing Tugger air hoist set in place

Construction Camp at Totoket Dam, Showing from Left to Right R. Blakeslee & Company's Office, Garage, Storeroom, Police and Medical Department Building, Two Bunk Houses and Commissary

Great Hill Tunnel and gate house which will deliver the water to a 48-inch cast iron main which will carry the water to New Haven.

The reservoir covers about 1200 acres and will hold a total of 16,000,000,000 gallons, of which 12,500,000,000 gallons will be available for use in the city. The main dam, the Totoket Dam, contains about 90,000 cubic yards of concrete. It is 100 feet high above the bed of the brook and the foundations extend about 20 feet below the brook into bed rock. The dam is 1050 feet in length, extended to a total of 1200 feet by the cut off walls at either end. The maximum height above rock is 120 feet. It is 11 feet wide on top and 80 feet wide at the base.

CONCRETING PLANT FOR TOTOKET DAM

The contractors, C. W. Blakeslee and Sons, New Haven, Conn., built a well-planned concreting plant upstream from the dam site and about 400 feet from the west abutment. The original plans called for taking all of the sand for the dam and other concrete structures on the project from below the flow line of the Totoket Reservoir, but the pit ran out at the end of the 1926 operations, making it necessary for the New Haven Water Co. to purchase an extensive sand pit about four miles from the dam. Stone was purchased from the New Haven Trap Rock Co.'s quarry adjacent to the Totoket Reservoir. Both sand and crushed stone were delivered by rail over the Branford Steam R. R. tracks, and the siding extended to the concreting plant.

Sand and stone were dumped into bins above the batchers which delivered directly to the two Koehring 6-bag mixers. The mixers discharged into a storage bin by gravity which delivered to the bucket of the 120-foot Insley steel tower. All concrete west of the tower was deposited by a Conveying Weigher Co. belt delivering to chutes. The delivery belt was 600 feet long from center to center of pulleys and was located 10 feet above the top of the dam on a steel truss structure. Concrete for a distance of 200 feet east of the tower was placed directly by counterbalanced chutes.

An 800-foot cableway was built with one tower located just west of the concreting plant on the upstream side of the dam and the other on the downstream side and near the east end. This cableway was used to handle forms, excavation and to hang chutes from and for placing the trestle across the stream from the conveyor belt. At one time a steam shovel was removed from the bottom of the excavation in two parts by the cableway.

A cement bag shaker house located about 150 feet from the mixers, produced enough cement to take care of all grouting of the dam and throughout the work on the Totoket Dam there were practically no rejects of bags returned to the manufacturer. The cement shaker saved about 2000 bags of cement in the construction of the dam alone.

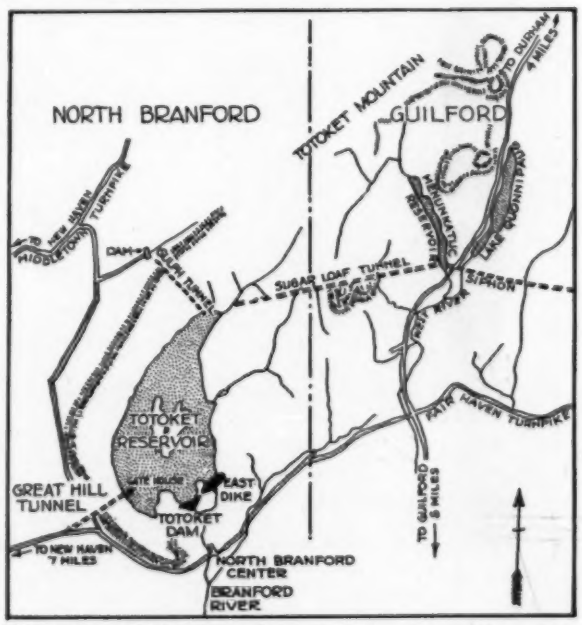
The spoil from excavation at the base of the dam and for the wing walls was cast against the downstream face of the dam and grassed. A crushed stone road is to be built along the top of the fill to facilitate necessary hauling and to permit the watershed inspectors to make their rounds.

IRON FENCE ON TOTOKET DAM

Instead of a single-rail or two-rail pipe fence, it was decided, at a cost that was only slightly larger than the two-rail fence, to erect an attractive Anchor fence, photographs of which are shown on the opposite page. The method of setting this fence in the concrete was novel and has proved most effective. Holes 12 inches deep and 5 inches in diameter were left in the concrete for the fence-posts, and after the fence-posts were placed in these holes and lined up, the holes were poured with Hydro-Tite, using a 5-inch split flange at the top as a form. This has made a firm, rust-proof setting for the fence-posts.

1928 CONSTRUCTION

The major activities in the work during the current construction season have been the tunneling for the outlet from the Totoket Reservoir underneath Great Hill which is the scene of the activities of the New Haven Trap Rock Co. and is owned by that organization; the completion of the East Dyke of the Totoket Reservoir and the driving of Sugar Loaf Tunnel nearly 3 miles in length.



Map of Construction Operations of the New Haven Water Co.

Concreting Plant for the Gate House at Totoket Reservoir, Showing, from Left to Right, the Insley Tower, Wooden Bins, Cement House and Derrick Used for Placing Forms

GREAT HILL TUNNEL

The Great Hill Tunnel is a 6-foot, 4-inch horseshoe of concrete, passing through a compromise section to a 48-inch cast iron pipe. The driving from the westerly face of Great Hill, the first 700 feet of the tunnel was through sandstone, then it entered the trap rock which extended through to the easterly face of the hill.

An 8-inch cast iron pipe was carried through the tunnel and is to be connected up with the gate house located 250 feet from shore in Totoket Reservoir as a means of draining the gate house should that be necessary at any time. For placing the 48-inch cast iron pipe in the west end of the tunnel, two 1½-inch square steel bars were set in the rock to hold the blocks through which 1-inch cable was run and thence out to the Atlas electric locomotive running on a 24-gage track. With this scheme it was possible to skid the pipe into place quite rapidly and then the joint was set up and poured with Hydro-Tite. This is said to be the largest pipe which has been poured with this jointing material.

The concreting plant over the west end of the Great Hill Tunnel consisted of a cement house to which the cement was delivered direct from the standard gage freight cars when it could not be used directly from the cars to the mixer. Both cement and lime came in over the standard gage railway spur of the New Haven Trap Rock Co. and crushed stone was delivered in the same manner. Sand was trucked direct to the platform and dumped into the wooden bins. On the far side of the railroad track from the cement house was a chute for the cement bags leading direct to the mixer plant. Beyond this was another standard gage railway track for cars of stone. The aggregate was stored in wooden bins above the two Blaw-Knox batchers. The Ransome 4-bag mixer was operated by air and handled the 1:2:4 specified mix, which was later changed to 1:2:3½ using Alpha cement, with entire satisfaction, producing a 3000-pound concrete. A 5 per cent admixture of hydrate of lime was used to increase the workability and waterproofness of the concrete.

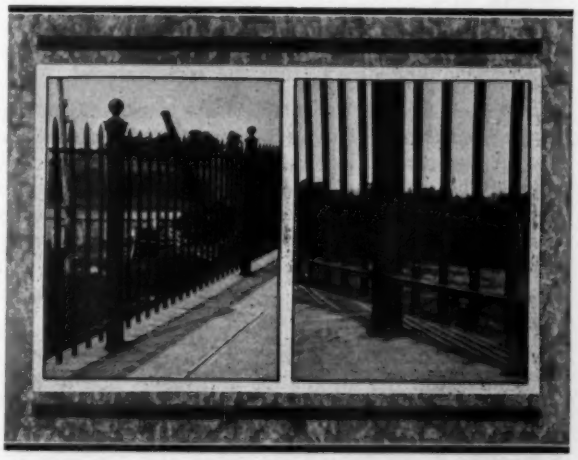
A novel but effective method of measuring the water for the mix was employed. A water barrel was set up with an overflow pipe running from the bottom to a height which would give a capacity of exactly 23 gallons. The flow of water into the barrel was controlled by an ordinary ball float valve. A set of nipples of various lengths was kept at hand to vary the height of the overflow pipe should more or less water be required to the mix, depending on the moisture content of the sand.

Concrete was discharged by the Ransome mixer into trains of specially built Atlas cars, each of which held a 4-bag mix. Because of the small clearance in the tunnel, these 7-foot, 6-inch cars had to be built very shallow to permit their dumping into the Ransome 14-foot pneumatic concrete placer after they had been pulled up an incline by an Ingersoll-Rand Tugger air hoist.

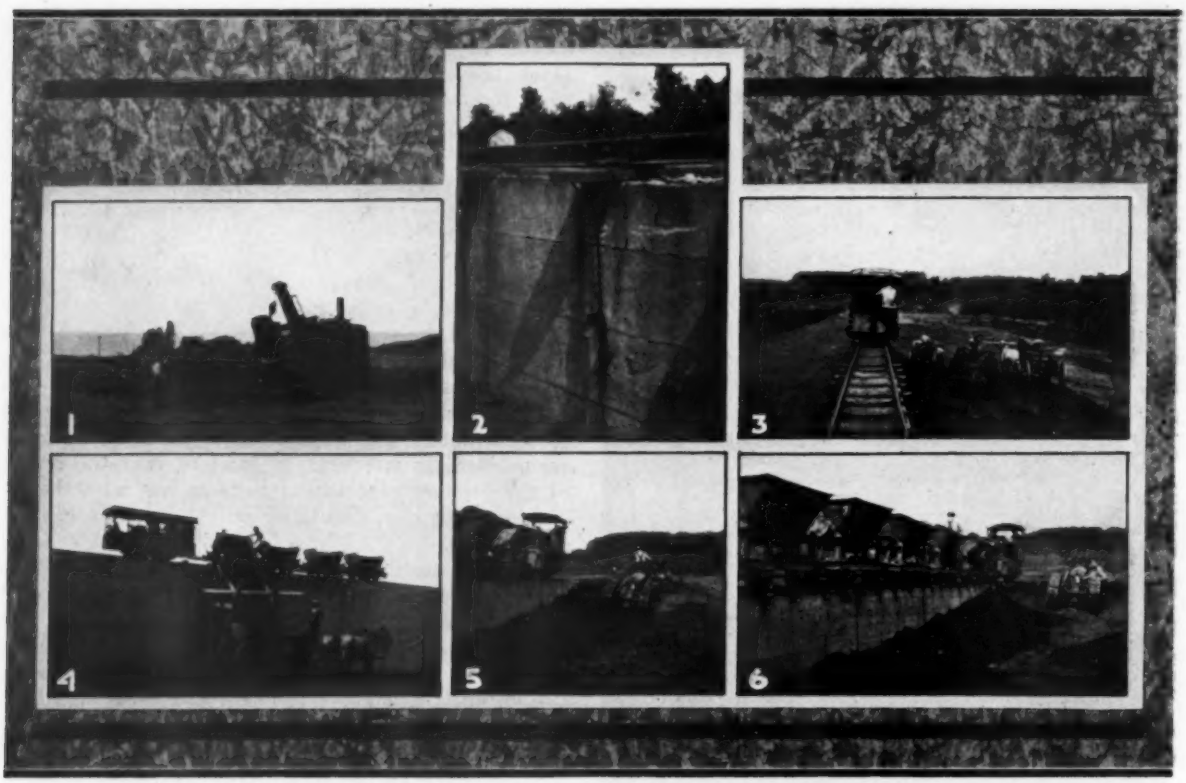
EAST DYKE OF TOTOKET RESERVOIR

The concrete core wall of the East Dyke is 1700 feet long and measures 30 inches wide at the top and is battered both upstream and downstream 0.05 foot per foot. It is carried down to rock and the top of the rock scaled off to insure good bonding between the concrete and rock. The base section was poured without forms 5 feet 6 inches wide and at depths varying from 12 to 20 feet, using a 1:2½:4½ mix with 4 per cent of lime. Industrial railway equipment brought the concrete from the mixing plant at Totoket Dam and a Browning crane placed the concrete in the forms above the ground surface using bottom dump buckets.

The 45,000 yards of embankment placed on the two sides of the core wall were secured by stripping below



Anchor Fence on Top of Totoket Dam, Showing Neat Appearance, and at Right Method of Supporting Posts With Hydro-Tite



BUILDING THE EARTH DYKE AT TOTOKET RESERVOIR

1. Erie steam shovel loading train of Atlas dump cars hauled by Whitcomb gasoline locomotive with earth excavated from below the projected flow line of the reservoir. 2. Method of anchoring 24-inch gauge industrial railway track to 30-inch top of core wall. 3. Burton locomotive pushing train of dump cars along the track set on top of the core wall. Note the team and wagon haulage supplementing the industrial railway. 4. Dumping cars into wagons from the top of the core wall through a chute. 5. Hadfield-Penfield one-man grader spreading earth fill and Austin Pup in background rolling the 12-inch layer. 6. Downstream side of the northeast end of the core wall with fill nearing top of wall

the flow line of Totoket Reservoir. Operations were carried at both ends of the dyke.

At the east end, two trains of 6 dump cars hauled by Whitcomb gasoline locomotives were used. Stripping and loading operations were carried on with an Erie steam shovel. At the other end one Burton locomotive with two trains of 4 cars each was loaded by another Erie steam shovel. At this end ten 2-horse Watson wagons also operated handling the earth as dumped from the trains through a chute into the wagon and also hauling direct from the steam shovel.

The 24-inch gage industrial track mounted on top of the 30-inch core wall gave an appearance of instability as the locomotive and cars both hung over the edge of the wall, particularly at points where the core wall stood 30 or more feet above the earth embankment. The stability of the track, however, was insured by wiring every third tie to form tie wires left in the core wall.

Operations at the west end were somewhat slower than at the easterly end because of the higher grade up which both the locomotive and teams had to haul. At the easterly end a Hadfield-Penfield one-man grader spread the earth in 6-inch layers which were compacted by an Austin Pup roller. On the west end the wagons dumped their loads from the steam shovel or from the industrial railway cars and it was spread by hand and rolled at night or in off hours by a Buffalo-Springfield steam roller. It was noted that the drivers rested their teams two or three times when pulling uphill with a load from the steam shovel. All teams were in excellent condition.

SUGAR LOAF TUNNEL

Sugar Loaf Tunnel which is being excavated to 8-foot diameter in rock and 6-foot, 8 inches finished section, is slightly over 14,000 feet in length and runs from the north end of Totoket Reservoir in a northeasterly direction to the west branch of the West River at the site of Menunkatuc Dam which is to be built in 1929.

The original plans called for the driving of Sugar Loaf Tunnel from two shafts, but the contractor agreed to maintain the same rate of progress from one shaft so the second was abandoned. The shaft is 95 feet deep and was excavated 10 x 20 feet in section with the 20-foot dimension across the tunnel. This made it possible to install two cages on a switch and in addition a 6-inch centrifugal electric pump with a Cameron air pump standby for pumping from the tunnel sump. Approximately 250,000 gallons of water are pumped from the tunnel each day.

The entire excavation in Sugar Loaf Tunnel is in sandstone. At one point an unusually heavy flow of water was struck which caused a slight delay. The water was deflected by sheets of steel and in its flow

of several months eroded a cavity equal to between 4 and 5 cubic yards of rock.

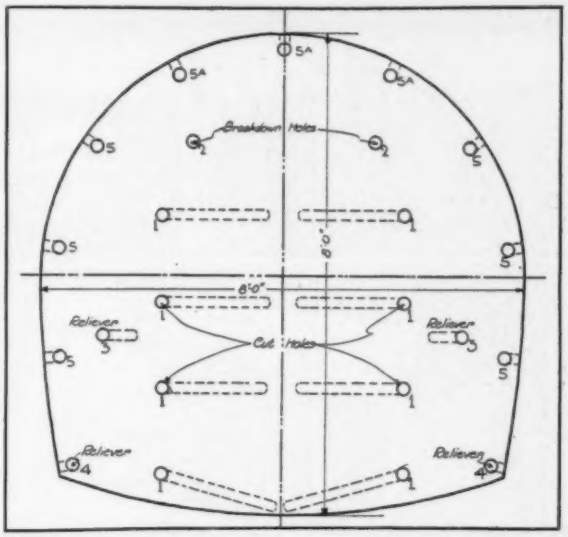
Work on the two headings has been carried through with two drilling and two mucking crews which have maintained a total progress of about 40 feet a day.

On the easterly face a Conway mucker was used delivering to Easton muck cars handled by Atlas storage battery locomotives. Ingersoll-Rand Leyner drills were used and holes driven from 11 to 13 feet deep. In the blacksmith shop at the head of the shaft an Ingersoll-Rand oil forge and electric press was installed to maintain the drill steel in first rate condition.

METHOD OF SHOOTING AT EAST FACE

A total of 23 holes was drilled for each shot in the east face of the Sugar Loaf Tunnel operations. As shown in the accompanying diagram, there were 8 cut holes, numbered 1, shot first, using about 100 sticks of dynamite. Then these 8 were cleaned and loaded again with direct action fuses. The two breakdowns, numbered 2, and two relievers, numbered 3, were loaded and connected with first delay fuses. Then the six rim holes, numbered 5, were connected with second delay fuses. The three top rim holes, numbered 5A, and the bottom relievers, numbered 4, were connected with third delay fuses and the whole fired.

The average run in a tunnel per face has been 20 feet a day with 544 feet as the best tunneling operation in one month. The tunnel is shut down 24 hours on Sunday.



Drilling and Shooting Plan for Operations at East Face of Sugar Loaf Tunnel

East End of Sugar Loaf Tunnel at Site of Menunkatuc Dam, Showing from Left to Right the Derrick Which Raises the Muck Cars from the Mouth of the Tunnel to the Spoil Bank, the Entrance to the Tunnel and at Extreme Right Muck Cars on Siding

The specifications call for an 8-inch concrete tunnel lining, into which points are permitted to intrude 2 inches. The packing of the tunnel with concrete is paid for only for 4 inches or more outside of the neat line. The contract between the New Haven Water Co. and the contractor is a price per foot of tunnel for excavation and another price for concreting, not the usual cubic yard prices.

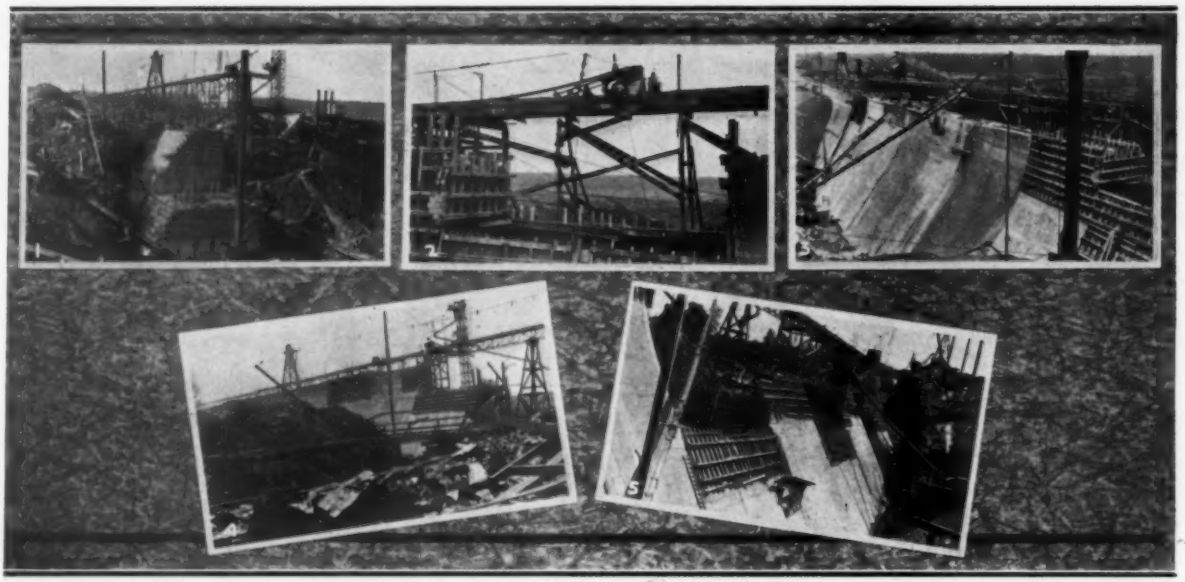
SURFACE OPERATIONS AT SHAFT

At the shafthead is located the field office of the engineering department of the New Haven Water Co., the compressor house, blacksmith shop, hoisting equipment for the shaft cages and the dump. In the compressor house is one Sullivan and one Ingersoll-Rand compressor and for the operation of the shaft cages a Lambert electric hoist was installed. All operations throughout the project so far as possible have been carried on by electricity. This was made possible by the large substation located at the quarry of the New Haven Trap Rock Co., in which the contractor is financially interested. The lines to the substation were larger than needed for the power for the quarry and were ample to carry the additional loads for construction operations in the North Branford project.

On the dump at the head of the Sugar Loaf tunnel shaft a Brookville-Fordson locomotive on a 24-inch gage track moved the cars to the end of the dump. The tunnel was well-lighted throughout by lights affixed to a water proof cable. The line for the tunnel was given by driving a well hole 150 feet west of the shaft. Through this well hole a steel wire was let down with a heavy plumb bob at the lower end immersed in water. Water seeping into the well hole caused so much vibration of the wire that it was necessary to line the hole throughout with stove pipe.

EAST PORTAL OF SUGAR LOAF TUNNEL

The East Portal of the Sugar Loaf Tunnel is at the



THE TOTOKET DAM NEARING COMPLETION

1. View looking west, showing maximum width of dam, concreting plant, and belt conveyor trestle. 2. View showing belt conveyor and "mule," or movable hopper over chutes, and method of placing concrete. 3. View looking west showing sections of dam completed to bottom of coping. 4. General view of dam, also showing trusses for carrying belt conveyor east of tower. 5. View looking east, showing sections of dam, each 48 feet in length

location of the Menunkatuc Dam which is to be built in 1929. The tunnel will run through the dam and have an intake so that water from the Menunkatuc reservoir may be admitted to the tunnel. The Menunkatuc reservoir will secure its water from a flashy stream, so that the elevation of the reservoir will rise rapidly. Advantage of this will be taken by drawing down the reservoir at all times to supply Totoket Reservoir where larger storage, both in area and volume is available.

SHORT TUNNELS

In order to facilitate the construction of Menunkatuc dam a short tunnel is being driven at the east abutment to make it possible at a later date to connect up with the watersheds easterly to the Hammonasset River. This tunnel is being driven by much the same methods as employed in Sugar Loaf Tunnel with a slight variation in shooting, and hand mucking is being used because the tunnel is on a 5 per cent grade. The muck cars are hauled in by cable and run out by gravity.

At the entrance to the tunnel there is a slight grade up which the cars are pulled by a rope to the double drum hoist niggerhead.

The Sugar Loaf Tunnel Shaft, Showing from Left to Right Compressor House, Hoist, Shaft, and Welding and Drill Sharpening House at Extreme Right. Beyond the Shaft is the Dump

CONCRETING PLANT AT TOTOKET RESERVOIR INTAKE GATE HOUSE

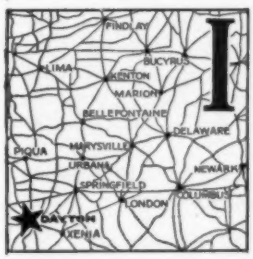
The concreting plant which was set up in July for the construction of the Totoket Reservoir intake gate house which will deliver water to the Great Hill Tunnel was the same plant slightly differently arranged, as was used in pouring Totoket Dam in 1927. A ramp was built from the roadway up to the cement house and a platform from which the aggregate was dumped. The aggregate was lifted by clamshell buckets on a Browning crane to wooden bins. Cement was delivered to the shed by trucks and from thence to the mixer by a belt conveyor. Both stone and sand were measured by two balanced buckets of ½-yard capacity for the sand and one-yard for the stone, dumping into the Koehring 6-bag mixer. A half bag of lime was added to each batch of concrete. The concrete was delivered to the gate house forms by means of an Insley tower and chutes.

PERSONNEL

The North Branford Project is being built by the New Haven Water Co. with C. W. V. Blakeslee & Sons of New Haven as the contractors. The work is under the personal direction of Clarence Blakeslee for the contractors, with W. H. Ryan as General Superintendent. E. E. Minn is General Manager of the New Haven Water Co., and A. B. Hill Consulting Engineer. Clarence M. Blair is Engineer-in-Charge of the work.

Concrete Aggregates Produced While Digging Sewage Plant Site

Ingenious Use of Equipment by E. H. Latham Company At New Sewage Disposal Plant in Dayton, Ohio



IN the construction of the Imhoff tank for the new sewage disposal plant for the city of Dayton, Ohio, the E. H. Latham Co. of Columbus, Ohio, had an ingenious equipment layout that tied together in a simple and effective manner the operations necessary for making the excavation, obtaining the aggregates for concrete and placing concrete in the forms.

The excavation required for the Imhoff tanks on this project is approximately 250 feet long, 250 feet wide and 20 feet deep. The site for this excavation is, by good fortune, on a deposit of excellent sand and gravel. Since considerable quantities of these materials are needed for later concrete work, it was only natural to save the material from the excavation and to include a small screening plant in the equipment for the project, so that the sand and gravel could be properly prepared for concrete.

The sand and gravel is covered by an overburden of approximately 5 feet. Below this, however, there was left some 15 feet of excavation through the usable material.

For making the excavation itself, the Latham Co. is using a 1-cubic-yard Sauerman slackline cableway excavator. The placing of the mixed concrete after the excavation has been completed and the forms placed will be done by a tautline cableway and concrete buckets.

To simplify both of these operations the company installed two movable towers. They are moved along the sides of the excavation. These towers are now being used to support the Sauerman cableway and they will serve later to support the tautline cableway while concreting is in progress.

The towers are built of wood supported on rails and are of a standard design for the operation of the tautline cableway. The slackline cableway excavator, however, was easily adapted to this anchorage. The head tower supports the two-drum hoist operating the slackline as well as the mast top assembly of operating blocks. The lower end of the slackline cableway trackline is attached to a bridle at the base of the tail tower. When the tautline is installed, it will be attached, of course, to the peak of each of the towers.

Excavating for Imhoff Tanks at the Dayton Sewage Disposal Plant. The Pit Shown Just Started in the Foreground Measured 250 Feet Square by 20 Feet Deep Upon Completion

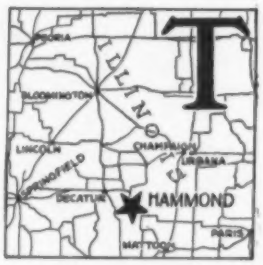
Gravel from the Excavation is Dumped Into the Movable Hopper in Front of the Traveling Head Tower

Since the slackline cableway is moved along the excavation as fast as the work progresses, it was not feasible to build the screening plant so that the cableway could discharge directly to it as in the usual installations. The material from the pit is being handled very easily, however, by means of a movable hopper which receives the load from the cableway bucket. This hopper moves on rails between the excavation and the head tower as shown in one of the illustrations. Under the hopper is a narrow gage track and small industrial cars receive the sand and gravel from the hopper and carry it to the screening plant at one side of the construction site. The screened materials are being stored in large piles and will be reclaimed later when the concrete mixing begins.

The E. H. Latham Co. was awarded the Dayton sewage plant contract only a few months ago. The Sauerman cableway operated on a span of 400 feet and averaged about 350 cubic yards of material per 8-hour day, and has made records as high as 470 yards a day.

Industrial Railway Used on 19.75-Mile Illinois Project

The McMahan Construction Company Laid 1208 Feet of 18-Foot, 9-6-9-inch Concrete Slab for Every Working Day



THE McMahan Construction Co., Rochester, Ind., was awarded the contract for the construction of 19.25 miles of 9-6-9-inch, 18-foot concrete pavement on Route 121, Sections 141, 142, and 143, near Hammond, Ill., on September 22, 1927. The grading was started on October 10, 1927, and stopped by the weather on November 1. Paving was started on April 11, 1928. Traffic was maintained by detours prepared and cared for by the State.

Grading

There was no steam shovel work on the job, all grading being handled by two Western elevating graders hauled by a Caterpillar Sixty and a 10-ton Monarch tractor. The earth was loaded into 2- and 3-up Western wagons which hauled to fill. The total cut was about 150,000 yards. An Adams 12-foot blade grader was used to shape the grade.

Final Grade and Form Setting

An Adams patrol grader, hauled by a Caterpillar Thirty, was used to dig the form trenches. The Blaw-Knox 9-inch forms were set by two head setters, each with a helper. To bring the final grade close to the contour of the pavement, a crown of one inch, a Hug subgrade planer was used. The grade was then rolled with a 5-ton Huber gas roller.

Aggregate

Both sand and gravel were purchased from the Montezuma Sand & Gravel Co., Terre Haute, Ind., and delivered by rail in hopper-bottom cars at Lintner, Pierson Station and Garrett, Ill., as required. The unloading plants were established at these three points successively as they divided the project in such a way that the maximum hauls were three and one-half miles to the mixer.

Typical Unloading Plant

The Lintner unloading plant, which was the first one established, served the mixer as it worked from the west end of the contract until the mixer was three miles east of Lintner, then the whole plant was moved to Pierson Station. Similarly the plant was moved to Garrett when the mixer was about three miles east of Pierson Station.

The unloading plant consisted of a Brownhoist crane with 1-yard Blaw-Knox clamshell. Two large pits were excavated beside the railroad track, sufficient to hold a car of gravel or sand. Then the railroad track was tunneled with a chute so that when the hoppers were tripped the material was run quickly into the pits. The clamshell could operate much more effectively in the pit than in the cars. It was found that 33 per cent more cars could be unloaded per day in this manner than clamming direct from the cars.

The crane loaded the material either to stockpile or to the 72-ton steel bin with Johnson batchers.

Industrial Hauling Equipment

All material was hauled to the mixer by industrial equipment. The 4-mile narrow gage industrial track runs through under the batcher bins and thence to the operation. Permanent passing sidings were regularly established every one-half mile and every morning, 1,000 feet ahead of the Koehring 27E paver, an extra switch was placed to serve that day's run.

There were three 7-ton Plymouth friction-drive gasoline locomotives, one 7-ton Midwest gear-shift gasoline locomotive and one 6-ton Burton friction-drive gasoline locomotive. The flat cars were made by the Austin Machinery Corp. and Lakewood Engineering Co., and 37-foot Lakewood steel batch boxes were used. The trains were made up of from 12 to 15 cars with two of the cars used to pile on the bags of cement for the batches. These were unloaded ahead of the mixer by three men, one of whom cut the bags open as they were stocked. The empty bags were returned to the cement shed on the flat cars where they were baled by one man.

Concreting

At the mixer the six bags of cement from the piles along the subgrade were emptied into the mixer by two men. One man was used to operate the hoist on the mixer to lift the batch boxes and three men were used to tip and reload them on to the cars.

The 10-foot Truscon center strip was set ahead of the mixer as it was easier to secure a straight line of joint. It was pinned every 3.4 feet with vertical rods and the required ½-inch deformed dowels set through, two to a strip. The dowels were 5 feet long. The continuous ¾-inch side rods were painted and oiled and set ahead of the mixer with metal rod supports every 5 feet. The rods were set 6 inches in from the form and 4½ inches from the subgrade. The rods were lapped 2 feet and the lap spread as the new Illinois specifications require this instead of the tied joint used in Indiana. The mixer skip had wooden blocks set on it so that when the skip was lowered it would be above the center strip.

The regular concreting crew used two spreaders behind the mixer and one spader. The two spreaders shovelled to the strike-off of the Ord finisher which had one operator who attended to it alone.

A Koehring scratch template was attached to the

mixer and the subgrade reduced or lowered as shown by the marks. The Illinois specifications will not permit any earth to be shoveled to the subgrade where it may be low unless it is hand tamped. As this is an expensive operation, most contractors prefer to keep the subgrade as close to the required line as possible and then when low spots do occur to place the small amount of extra concrete.

Two men with 10-foot straight edges hand-finished the concrete behind the machine to take out any high spots and to remove the laitance raised by the finisher. These men also covered the pavement with burlap. The burlap was sprinkled until morning, when it was removed and calcium chloride was spread before 10 o'clock at the rate of 2.5 pounds per square yard. The pavement was opened for traffic in 21 days.

Average Amount of Concrete Laid Per Day

The average run for the concreting crew for every day worked on this project was 1,208 linear feet. The record run for 1928 was 1,815 feet. The contractors set up ice cream, all that the men could eat, for the entire crew the day following the record run and the offer stands that the feast will be repeated any time the standing record is beaten.

Other Local Paving

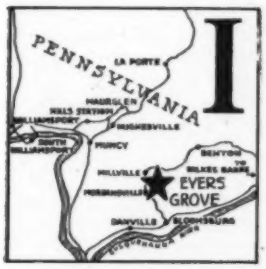
The McMahan Construction Co. also laid a half-mile of concrete pavement 18-feet wide for the County and State from Route 121 to the B. & O. R. R. tracks in the City of Hammond and a similar stretch 9 feet wide for the County, from the same route to the tracks in Pierson.

Personnel

The McMahan Construction Co. maintained a field office in Hammond throughout the length of this contract. The home office in Rochester, Ind., is in charge of Otto McMahan, and either Patrick McMahan or William A. McMahan was on the project at all times in direct charge with John Schaaf as Superintendent. Warren W. Woods was Resident Engineer for the State and W. B. Machin, Inspector.

Well-Organized State Road Project

Colonial Construction Company Uses Drag Plate for Center Joint On Keystone State Job



INNOVATIONS are few in the road construction field. Each and every job must be organized by the contractor to fit the peculiar conditions that exist at the site of the work. The Colonial Construction Co., of Pittsburgh, Pa., however, is trying out the drag plate for the formation of the slot for the premoulded expansion joint on its job on Pennsylvania State Highway No. 239 and, according to C. B. Gregg, Superintendent, it has worked out very successfully.

This job is located north of Bloomsburg, Pa., in a section that has been in need of a good road for some time. The work extends from Millville on the north to Mordansville on the south with Eyers Grove, the base of the contractor's operations at the center point of the work. The work consists of 4 miles and 70 feet of reinforced concrete 9- 7- 9-inch paving, 18 feet wide, with the necessary grading and drainage operations. About one-half of the work is in new location, the remainder being along the old road. The work has been handled entirely by the Colonial Construction Co. without any sub-contractors or rented equipment. Work was started on September 1, 1927, and grading continued until November 21, when work was discontinued for the winter. Work began again on April 15, 1928, and pouring was completed June 25, and the entire project finished August 1.

Cut and Fill

Cut and fill very nearly balance on the job, there being 45,000 yards of cut, about 35 per cent rock, and 50,000 yards fill. The cut was handled entirely by two Type-B2 Erie steam shovels loading into Autocar trucks, Iron Mules and tractor hitch Watson wagons hauled by a Caterpillar Thirty. The fill was leveled by tractor-drawn Russell graders and compacted by Buffalo-Springfield and Galion Master 10-ton rollers. As the base course was almost entirely a shale there was no need for gravel or cinders to stabilize the subgrade.

Preparation of Subgrade

After the 10-ton rollers had compacted the subgrade, a Lakewood sub-grader was run over the base to bring it finally to grade and then a 3-ton Austin Pup roller completed the rolling. A Carr Formgrader was used to prepare the base for the 9-inch Blaw-Knox steel forms.

Aggregate

Stone for the 1:2:3 mix was purchased from the Chemical Lime Co., Bellefonte, Pa., and delivered at the site of the central proportioning plant at Eyers Grove at the center of the job. The stone was dumped into a pit and removed by a clamshell bucket on one of the Erie machines. Sand was bought from the West Branch Sand and Gravel Co., Williamsport, Pa., and also delivered by rail over the Pennsylvania lines. The sand was unloaded direct from the cars to stock piles as received.

The 35-ton Blaw-Knox bin with weighing device was served by the Erie converted crane. Batches were loaded into Autocar trucks, two batches to a truck and the 8 bags of Universal cement loaded on to the batches at the bin. The batches weighed 4,400 pounds each including stone, sand and cement.

CONCRETING

Pouring the job began at the Millville end and continued to Eyers Grove, then the 27E Foote paver was moved to the Mordansville end and worked back to Eyers Grove.

Two men were used at the mixer to handle the cement. The 8 bags, as mentioned above, were loaded at the bins, and when the batch reached the mixer and was ready to be dumped one of the cement men cut the bag open and the other emptied it. There was 1 mixer man, 4 men spreading, 1 man spading at the forms, 2 men placing steel, 1 man operating the Lakewood finisher, 2 surface finishers floating the surface and edging the slab, 1 center line finisher with helper, 1 man to operate the Dow Chemical Co. calcium chloride plant which furnished the 2 per cent solution for the mixing water, 2 men handling the burlap and 2 men sprinkling the burlap after laying. In addition there were 2 other men who dumped the trucks into the mixer skip.

LONGITUDINAL CENTER JOINT

The longitudinal center joint instead of being formed by placing the premoulded expansion joint ahead of the pouring was formed in the concrete as placed by dragging a 45-foot steel plate along as the mixer moved ahead. The plate, which is made in three 15-foot sections, measures ⅜ inches thick and 2¼ inches wide for the first two 15-foot sections, and ¼ inch wide and the same depth for the third section. The drag was attached to the mixer axle by a cable and moved ahead automatically on every 15-foot move of the paver.

The drag was held in place vertically by ⅜-inch steel stirrups welded to the ⅝-inch center reinforcing bars at 2½-foot intervals. To prevent interference with the expansion joints placed transversely, every 150 feet the joint material was delivered slotted to permit the drag to pass through. The barricade that supports the expansion joint was also slotted.

When pouring was completed at the end of the day the mixer was moved ahead 45 feet to completely remove the drag.

The premoulded expansion joint was received at the job in 5-foot lengths, 3 inches deep and ¼-inch thick. The finisher working from a bridge carried on wheels on the forms inserted the guides for the expansion joint. These consisted of two thin angle irons held exactly in place by a second bridge below the bridge from which the finisher worked. The guides were inserted, a tool was run through the slot to clean it thoroughly, the expansion joint was put in place, lightly tamped and the guides removed. Following this the joint was floated on either side and then finished with an edger of ⅛-inch radius.

HEADWALLS

All headwalls for culverts and small bridges were poured by the big mixer as work progressed. Two carpenters with three helpers were able to set up all forms ahead of the mixer to permit prompt pouring of the walls.

PERSONNEL

The Division Engineer for the Pennsylvania Department of Highways in charge of this project was J. S. Ritchey, with W. E. Bailey as Assistant Division Engineer. J. C. Whalen was Chief Inspector for the State and C. B. Gregg, Superintendent for the Colonial Construction Co.

Handling Gary, Ind., Sand With an Austin New Era Elevating Grader, Western 7-Yard Crawler Dump Wagons and Caterpillar Tractors

Handling Sand with an Elevating Grader

EVEN sand, always a hard proposition for earth-handling contractors, has now been handled with an elevating grader. Gary, Ind. is noted almost as much for its sandy soil as it is for the steel it produces. The soil is very fine and blows readily. William Hillmer, a contractor on sub-division work in Gary, was recently faced with the problem of cutting a street through a sand dune and filling in another stretch about half a mile away. He used an Austin New Era elevating grader with power take-off, delivering to Western 7-yard crawler dump wagons, all hauled by Caterpillar tractors.

If it had not been for the power-take-off feature of the elevating grader it would have been impossible to have used it in the shifty sand because the elevators on other elevating graders driven through the rear wheels failed to function because they could not get sufficient traction in the sand. This is probably the first time on record that an elevating grader has been used successfully in Gary sand and points the way to lower costs on work of a similar nature.

The 7-yard Western crawler wagons actually carried five times as much as ordinary horse-drawn wagons. Moving through the soft sand on their Athey truss wheels, they were handled without difficulty by the Caterpillar tractors, according to the report, and because of their traveling and turning speeds were able to keep the grader working to capacity.

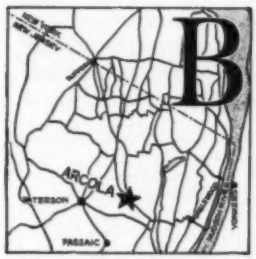
With the speed of operation greatly increased and the operating crew reduced to four men the possible savings are readily seen, especially when the cost is compared with that of doing the same work with scrapers which heretofore have been about all that have been used on such operations.

State Highway Bids Broadcast

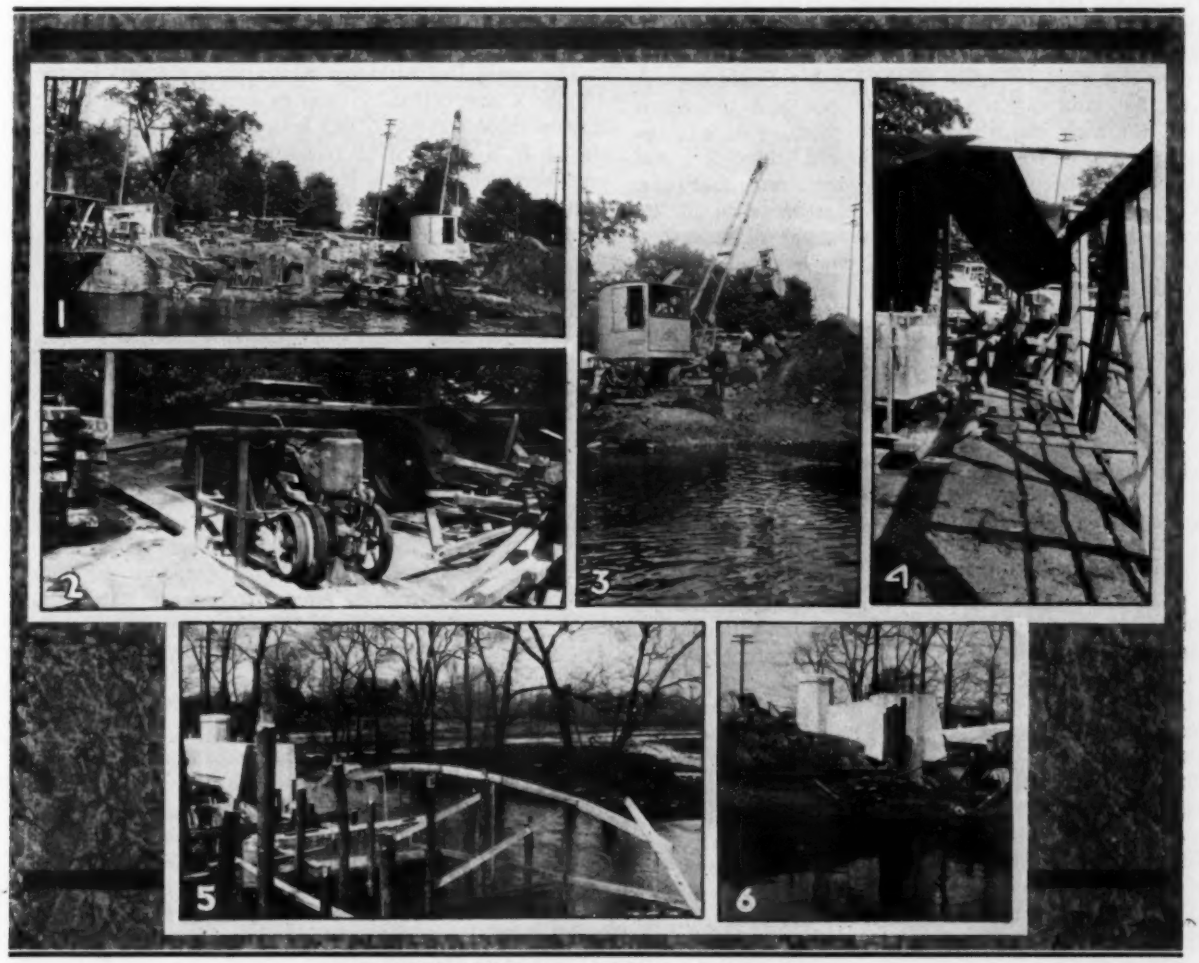
THE Department of Highways of Pennsylvania is broadcasting through Pennsylvania State Police Station WBAK the results of all bids received on the various bidding days of the Department. This station operates on a frequency of 1000 kilo-cycles, or 299.8 meters, by authority of the Federal Radio Commission. In announcing the service, the Department called attention to the fact that this is the season of the year when every day is vital to a contractor in pursuing his work, and many contractors feel that they cannot conveniently go to Harrisburg to secure this information promptly. It is with the thought of assisting the contractor that this service has been established. Announcement is made at 12 o'clock noon and at 1:30 P. M., Eastern Standard Time, on each letting day. The Department has asked all contractors who are interested in this information to report to the Department how it was received and whether a continuation of such service is justified.

Concrete Arch Bridge Built Under Difficulties

Attractive Structure Completed at Arcola, N. J., by Dansen Construction Company of Lodi Under Bad Water Conditions



BRIDGE construction under difficulties adequately describes the conditions surrounding the building of a new concrete arch bridge across the Saddle River at Arcola, N. J., in the vicinity of the so-called "Old Mill," a point well known in Bergen County for a great many years. This bridge replaced an old span which was built by the Riverside Bridge Co., in 1885. The old structure was of wrought iron and built to carry 3-ton loads of horse-drawn vehicles. Several studies have been made, dating back as far as 1910, for the building of a new bridge at this particular point. Plans were never carried out, the old bridge having been strengthened by the building of a center pier and the redesign and reconstruction of the truss, making the old bridge safe for motor loads of 20 tons, but with a width of only 17 feet between wheel guards. Considerable difficulty was encountered by traffic, however, at this point in the passing over of heavy loads, causing great inconvenience to surrounding residences due to the vibration in the planking. In 1924 a new double deck, separated by an asphalt cushion,



1927 *OPERATIONS AT ARCOLA BRIDGE SITE*

1. General views of operations at start of excavation for east abutment. 2. Novo saw rig for cutting heavy timbers and form lumber. 3. Orton crane and clamshell handling excavation. 4. Gasoline engine and 4-inch centrifugal used to dewater caissons, mounted on old bridge. 5. Beginning of pile centering for arch forms. 6. The west abutment completed

was built and this temporarily took care of the noise condition.

GENERAL DESIGN OF NEW STRUCTURE

Plans were made for a 70-foot concrete arch of 8-foot, 6-inch rise, 16 feet 9 inches south of the old bridge as measured between the center lines of the old and new structures. This was in 1927. The new bridge has a width of 30 feet between curbs and two 7-foot sidewalks. The new structure extends 32 feet further downstream than the old one and results in moving the position of the crossing south with broader intersections with the heavily traveled Arcola and Paramus Roads on the East bank and Swamp Road on the west bank of the Saddle River.

CONTRACT CHANGES

The contract for the construction of the Saddle River Bridge was awarded September 2, 1927, to the Dansen Construction Co. for $63,778.80. The plans as then made proposed to raise the grade of the road at the bridge four feet and, as the distance from the surface of the roadway to the underside of the arch is 2 feet, would have brought the arch 2 feet above the old bridge deck which was considered sufficient. An investigation was made to determine the high water mark in previous years. John Terhune who had lived on Swamp Road just west of the Saddle River for many years furnished the office of the County Engineer with valuable information on this subject with the result that the high water mark of October, 1903, was determined to be 10 inches above the old bridge deck and this had not been equalled by any storm since that time. The height of the new bridge, together with its increased span of 10 feet more than the old one was considered sufficient and would have undoubtedly been enough to take care of any freshet without backing up the water or without endangering the bridge.

There was unusually high water, however, early in October, 1927, the water reaching 2 inches over the old bridge deck and so the decision was made for the added safety of the bridge and also for scenic effect to build a bridge two feet higher. The added cost of higher walls and longer approach fills besides providing a larger water way, at the same time benefitted the approach conditions on both sides.

ADDITIONAL LAND ACQUIRED

A matter of importance from the first was known to be the acquirement of sufficient land. The scenic appearance of this locality is due to a number of features such as the mill, the waterway below the mill, the old Easton estate to the south with its rustic bridges, fountain and lawns, the road grades and, especially the trees, as these, taken collectively make up the picture and the destruction of any of these would seriously mar the beauty of the place.

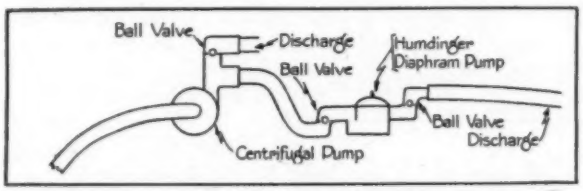
The trees on the north side of the road were all to be preserved, but two of them on the east bank had their roots cut back so far that they were in danger of blowing over and had to be removed. A continuous row of trees, however, was left along the west bank between the road and the waterway.

FEATURES OF DESIGN

The arch has a thickness of 18 inches at the crown and 36 inches at the skewback. The percentage of steel at the crown is 1.45 and at the skewback 1.31.

The arch was analyzed for a dead load, live load on half the span, live load on the whole span, rib shortening and a temperature range of 40 degrees Fahrenheit each way from normal. The arch was poured in one day at an average temperature of 60 degrees Fahrenheit. The live load was taken as 200 pounds per square foot.

The maximum stresses at the crown were found to be, for the concrete 561 pounds and for the steel 5335 pounds, produced by full live load and a drop of 40 degrees Fahrenheit. The maximum stresses in the skewback were found to be for concrete 646 pounds and for steel 13,333 produced by live load on one half the span and a drop of 40 degrees Fahrenheit.



Scheme of Centrifugal and Diaphram Pump Hook-up

PROCEDURE IN CONSTRUCTION

The method of handling excavation employed by the Dansen Construction Co. was to excavate the east side first in three sections. The first wood sheet piling was driven to a depth of 19 feet on the south side of the east abutment, using a Union air hammer. This open caisson was unwatered in the morning with a 4-inch centrifugal belted to a C H & E engine and then leakage taken care of for the rest of the day by a Humdinger diaphragm pump. The accompanying diagram shows the interesting hook-up arranged by the engineers of Ralph B. Carter Co., New York, for the Dansen Construction Co. on this project. The problem arose when quicksand was struck that the flow of water through the wood sheet piling was too rapid for the Humdinger diaphragm pump to handle all of the time and yet was not sufficient to make it economically possible to maintain the 4-inch centrifugal pump in operation at all times. The Carter engineers rigged up the layout shown in the accompanying diagram with the Humdinger diaphragm pump connected to the discharge of the centrifugal pump. When the water was completely pumped out of the caisson with the centrifugal pump, the diaphragm pump kept the excavation dry. When the excavation started to fill up with water so that the diaphragm pump could not handle the extra capacity, the centrifugal pump was primed by the diaphragm and pumped the excavation dry. This hook-up was so successful that it has been duplicated on other jobs around New York City, notably for unwatering a manhole being built by the New York Telephone Co. at Babylon, L. I., the difference in the jobs being that on the Babylon work well points were used. It was found possible by the use of a diaphragm pump and the centrifugal to pull a vacuum of 26 to 27 inches on the well points, at the same time keeping the excavation dry. The east side excavation was handled in three sections, the caissons measuring 28 x 17½ feet, 32 x 19 feet 6 inches, and 32 by 17 feet.

The excavation on the east side was chiefly hard pan and rock. It was necessary to go below the elevation shown by the original wash borings on the east side, while on the west side rock was not as deep as the boring indicated. The last wall on the east side excavation was poured on November 23, excavation having started September 7, 1927.

The excavation on the west side using the same Orton crane and clamshell bucket began on December 1. Three wood sheet piling caissons were also used on the west side measuring 32 x 17½ feet, 32 by 19½ feet and 32 x 17 feet. Considerable difficulty was experienced on the west side with quicksand and also with the sheeting springing out of line as it was driven. It was necessary to cut off the sprung sheeting and then to dig beneath the sheeting as it was driven. The sheeting on the east abutment had been jetted. It took very nearly one month to excavate the south caisson on the west side. The other caissons were excavated in about ten days each.

The placing of the arch forms was started April 1, 1928. It had been expected that considerable work could be done on these during the winter when the stream would be frozen over, but the large number of thaws and resulting high water made even the placing of the piles in the stream for the support of the arch forms a difficult matter and seriously delayed the work.

A 1:3:5 mix was used for the foundation and walls and a 1:2:3 mix for the arch and rails. Sand from Deckers pit in Paterson was batched with the coarse aggregate at the pit and hauled to the two 21-E Multi-Foote pavers which poured the arch continuously on May 1, starting at 6 in the morning and completing the north section by 2 P. M., when 15 minutes were taken to shift the mixers and then the pouring of the south section began immediately and was completed by 10 o'clock at night.

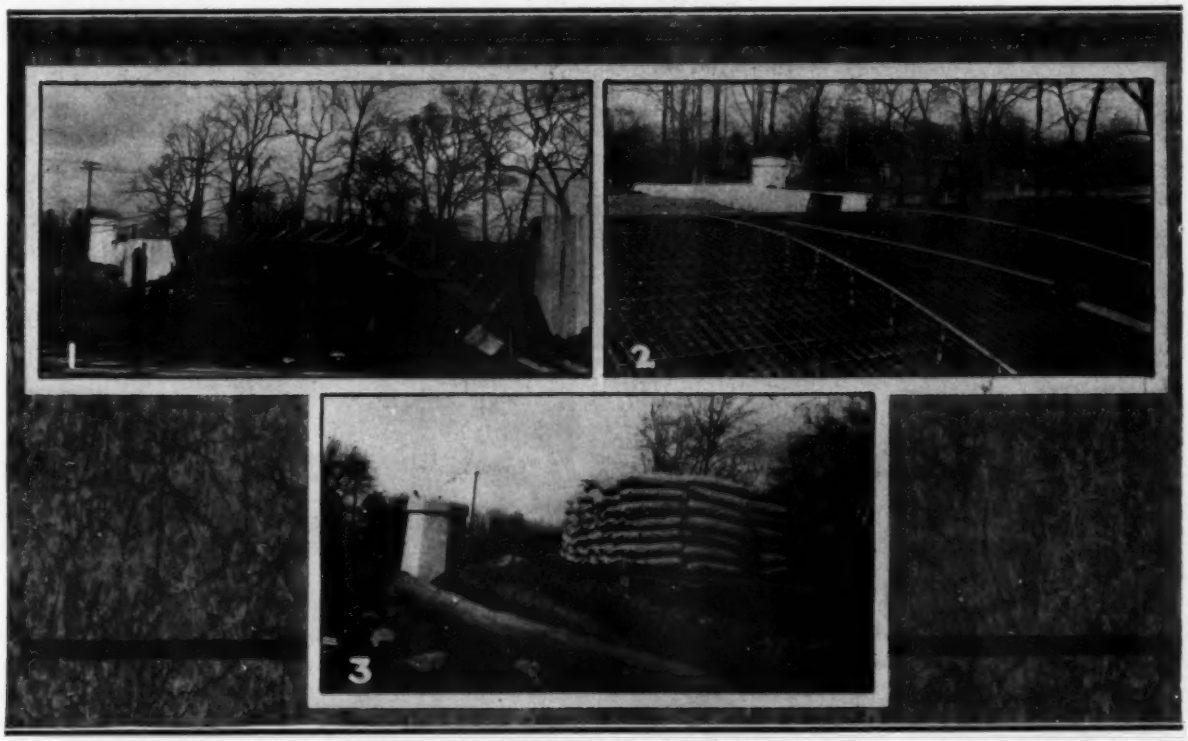
There is no reinforcement in the walls and foundations, but 1⅛-inch Havemeyer square bars were used at the skewback of the arch and 1-inch bars throughout the remainder. The steel was placed 5 inches from the bottom of the arch near the haunch and 3 inches for the remainder of the arch. All bars were spliced with a 36-inch lap.

CONCRETING OPERATIONS

The first pouring on the east side wall and pier was done on September 28, 1927, the second October 12 and the third October 31. The first pouring on the wide side wall and pier took place on December 12 and 13 when the weather was mild. The second caisson was poured January 18 and 19 and 20 when the temperature was 36, 30 and 30 degrees, respectively. January 21 was too cold for concreting as the temperature remained at about 10 degrees Fahrenheit throughout the day. The third caisson on the west side was poured on February 29 when the temperature ranged from 26 degrees in the morning to 46 at noon and 46 degrees at night.

The contractor reported particularly fine cooperation from the aggregate producers as it was not possible to hold the wet sand in the hoppers because of the danger of freezing.

Cal, a concrete admixture, was used in the wall whenever the temperature showed a drop toward freez-



STATUS OF ARCOLA BRIDGE ON APRIL 25, 1928

1. *Centering and arch forms complete.* 2. *Steel reinforcing in place with lathing strips indicating top elevation for concrete.* 3. *Pennsylvania-Dixie cement stored on job in paper bags*

CONTINUOUS POURING OF THE ARCH ON MAY 1, 1928

1. Domestic triplex pump with 6-horsepower engine which supplied water from Saddle River to the two 27-E povers. 2. White truck with Van Dorn hoist, one of the fleet owned by Harris & Barton, Paterson, N. J., which delivered the proportioned batches on schedule. 3. One bucket of Cal was added to each batch when pouring the pedestals, walls and arch. 4. Multi-Foote 27-E paver chuting concrete to forms at west abutment. 5. Detail of Havemeyer 1⅛-inch and 1-inch reinforcing at branches of arch. 6. Multi-Foote 27-E paver discharging batch into Lansing concrete cart. 7. Pouring north section of arch from Lansing concrete cart. The completed bridge is shown on the cover of this issue of CONTRACTORS AND ENGINEERS MONTHLY

ing. This happened twice and materially aided the operations. Cal was also used throughout the pouring of the arch and in the top walls and rails and aided in producing an excellent finish on all these parts. The contractor reported that less water, giving a smaller slump, could have been used and would have helped particularly in pouring the skewbacks.

COMPLETING THE STRUCTURE

The bronze lighting standards were erected at each end of the bridge and a penetration macadam pavement 6 inches thick is to be laid across the roadway.

PERSONNEL

The bridge was constructed by the Dansen Construction Co., Lodi, N. J., with Anthony Dansen acting as his own superintendent, under the direction of the office of the county engineer, Roscoe P. McClave, County Engineer with John Wissing in charge of layout, J. D. Polhemus as Inspector and J. Scott Thompson of the County Engineers Department of Bergen County, Designing Engineer.

The Construction Show—S. R. O.

Cartoon courtesy of Collier's

Folks, I want to thank you for the interest you have shown us while we have labored here. Your response has been exceptional. During the all-too-short three-week period that we have been excavating here we have drawn capacity crowds at every performance. Capacity crowds in spite of one day's rain and the two days' exhibition across the street when the new clothing store sign was erected. Those of my friends here who enjoyed seeing me put this giant steam shovel through its paces may be interested to know that we are working next week under more ideal conditions on a larger excavation at the corner of Fifth and Main Streets. I thank you

The Construction of Shaver Lake Dam

By O. J. Schieber

Engineer, Division of Construction, Southern California Edison Co.

THE Shaver Lake Dam is a part of the Southern California Edison Company's Big Creek-San Joaquin River hydro-electric development and is located in the Sierra Nevada mountain range, approximately 70 miles by rail, northeast of Fresno, California, in the Sierra National Forest. It is a concrete structure of gravity section and was built by the construction forces of the Southern California Edison Co. in 1926 and 1927, for the storage of water to be utilized for the generation of electrical energy during the low run-off period of the various Big Creek streams.

Shaver Lake Dam was built to create the Shaver Lake Reservoir, which is one of the largest artificial lakes in California. It has a shore line twenty-two miles in length, a maximum depth of 175 feet and a storage capacity of 135,283 acre feet. The water stored in this reservoir originates from the following drainage areas: Mono Creek, Bear Creek, South Fork of the San Joaquin River above Florence Lake Dam, Big Creek, Pitman Creek and Stevenson Creek, which totals 448 square miles of watershed and is conveyed to this storage reservoir through 24.6 miles of conduit, made up of 20.5 miles of tunnel, ranging in size from 7 x 7 to 15 x 15 feet, driven through hard grey granite, and 4.1 miles of riveted steel pipe line. From this storage reservoir the water is dropped consecutively through three power houses, which have a maximum generating capacity of 254,400 horsepower, after which it goes on down the San Joaquin River to irrigate the fertile farm lands of the San Joaquin Valley.

Shaver project was originally started in 1919 when the Southern California Edison Co. purchased the properties of the Fresno Flume and Lumber Co.; however, the actual construction of the dam and reservoir was not started until the spring of 1926, after an extensive study of the whole Big Creek San-Joaquin River project, coupled with surveys and dam site drillings for the proposed Shaver Dam, dictated that the most economical development for Shaver would be to provide storage for 135,000 acre feet of water by the construction of a gravity type dam, 183 feet high and 2,220 feet long.

Looking South, Showing Five Power Shovels Excavating the Foundation for Shaver Dam

Design of Dam

This dam was designed as a pure gravity structure and resists the load solely by its own weight. The resultant stays within the "Middle Third" when an analysis is made of a normal vertical section, one foot thick and whose sides are vertical planes. The weight of concrete assumed in designing was 145 pounds per cubic foot; no ice thrust or back water pressure was considered. The body of the dam was not designed for uplift, but the base was designed for full hydrostatic pressure at the heel, tapering to nothing at the toe over 10 per cent of the foundation area. The curve of the dam is so slight that no arch action was considered in the computations for the stability of the structure.

General View, Showing the Excavation of Shaver Dam and Also the Mixing Plant, Foundation of the Double Tower, Crushing and Screening Plant With Cement Warehouse and Construction Camp

Vertical contraction joints were placed at intervals of 50 feet. In addition to the usual keyways, a continuous copper plate was built half into the concrete on either side of these contraction joints and 2 feet 6 inches back from the face of the dam. These plates have a corrugation in the center to allow a slight movement without rupturing, and they were placed in lengths of 10 to 12 feet, the joints between sections being lapped and brazed.

Preparation of Foundation

A row of grout-holes, 10 feet apart and 12 to 20 feet into bedrock was drilled along the upper line of the dam foundation, through which pressure grouting was done. A sloping drainage and inspection gallery, 12 feet high and 4½ feet wide was built in the dam from

which holes were diamond drilled well into the rock foundation of the structure to relieve any possible hydrostatic pressure that might develop there.

Excavation and the construction of working plants were started in May, 1926, and by September 1, 1926, the first concrete was placed. All loose overburden was sluiced off, after which the rock was blasted and removed with steam, gasoline and electric shovels, tramways, trucks and by hand. A total of approximately 126,000 cubic yards of material was excavated from the dam foundation, of which about 50 per cent was solid rock and the remainder earth and decomposed granite.

CONCRETING

All aggregate for the 283,000 cubic yards of concrete in the dam was made from native granite quarried about a mile from the crushing and screening plant at the dam and was transported from the quarry to the crushing plant by an electrically operated narrow gage tramway. This aggregate was crushed, screened and stock piled in the following sizes:

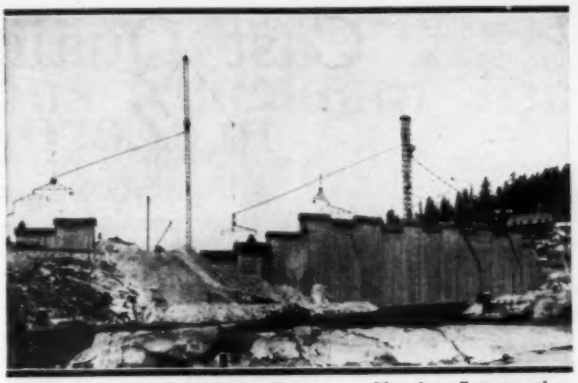
Sand—All material passing a ¼-inch screen.
No. 1 Rock—All material retained on a ¼-inch and passing a 1½-inch screen.
No. 2 Rock—All material retained on a 1½-inch and passing a 3-inch screen. (No. 1 and No. 2 rock were combined during 1927 operations.)
No. 3 Rock—All material retained on a 3-inch and passing a 6-inch screen.

The mix was approximately 1 sack of cement to 3 cubic feet of sand, 1.8 cubic feet of No. 1 rock, 4.0 cubic feet of No. 2 rock and 2.2 cubic feet of No. 3 rock. This gives approximately 8 cubic feet of concrete per sack of cement, or 0.84 bbls. of cement per cubic yard of concrete. This mix and aggregate gave a concrete with a 28-day strength of approximately 1,800 pounds per square inch.

SEASONAL CONSTRUCTION NECESSARY

The extreme weather conditions experienced at the location and elevation (5,370 feet above sea level) of the Shaver Dam made seasonal construction of this structure the only safe and economic method to pursue. Since it was desirable to store the spring run off of 1928 in this reservoir, it was necessary to complete this structure in two seasons, namely, the summers of 1926 and 1927. To do this required a very dependable mixing and placing plant and one with a capacity of approximately 1,500 cubic yards per day. This was accomplished by a carefully designed mixing plant composed of three two cubic yard tilting drum concrete mixers, discharging directly into a hopper at the base of a 2-cubic yard, 340-foot double compartment Lakewood placing tower, which, in turn, elevated the concrete to an 18-inch gravity chuting system. In addition to this main double compartment placing tower, two auxiliary 1-yard Insley towers were used at each end of the dam to pour the concrete that could not be reached by the central plant. Concrete was delivered to the end towers from the central mixing plant by tramways erected on the downstream face of the dam. An average of 1,431 cubic yards of concrete per day was placed by this plant set-up with a maximum of 1,808 cubic yards for a day's pour, a day consisting of one 11-hour shift.

Looking South Along the Downstream Face of the Completed Shaver Dam



View of Shaver Dam from Upstream, Showing Construction Nearing Completion

During the 1926 season, from May to the latter part of November, practically all of the dam excavation was completed and 67,000 cubic yards of concrete were placed before the freezing weather made it necessary to discontinue operations until April of 1927. The remaining 216,000 cubic yards of concrete were placed and three coats of Inertol waterproofing were applied to the upstream face in the 1927 season, from April to November, and all camp and plant facilities were dismantled and removed.

PERSONNEL

The construction features of this project were carried out under the general supervision of G. C. Ward, Executive Vice-president; E. R. Davis, Manager of Construction, and D. H. Redinger, Resident Engineer. H. A. Barre, Executive Engineer, is to a large extent responsible for the general scheme of development. H. W. Dennis is Chief Civil Engineer and H. L. Doolittle is Chief Designing Engineer.

$4,000,000,000 Thus Far for 1928 Construction

MORE than four billion dollars have been expended for construction operations of all types in the United States since the beginning of 1928, according to statistics recently compiled by the Associated General Contractors of America. The figures based on actual shipments of construction materials show the volume of operations carried on during the first seven months of 1928 to be three per cent greater than the total recorded for the corresponding period of 1927.

Cast Quality Concrete in Zero Weather

By Wyatt B. Brummitt

IN order to effect the economies of Spring occupancy the Goetz Brewery, St. Joseph, Mo., undertook the construction of extensive additions late last fall. The new buildings, refrigeration and cold storage plants were begun while the weather was still mild and were carried on toward completion during the severest cold of the winter without interruption or delay.

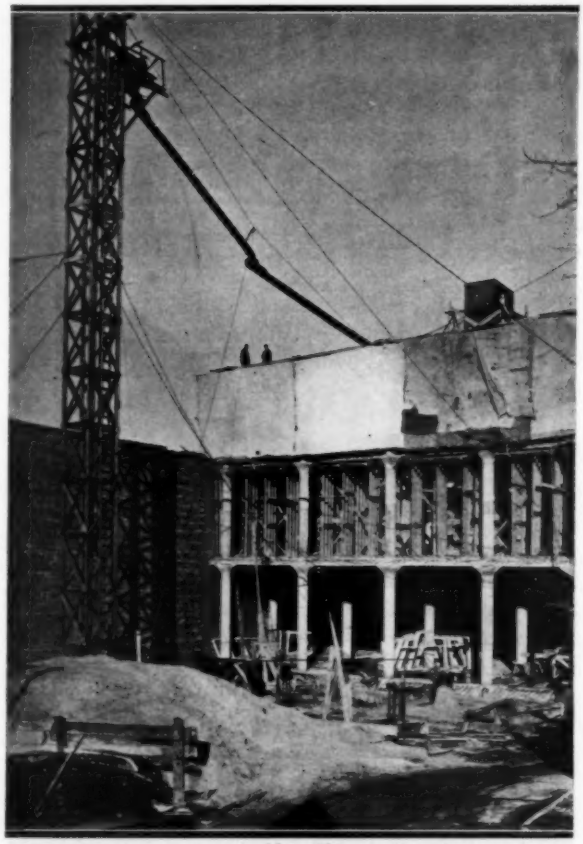
With the exception of a cork-and-brick exterior curtain wall all construction is monolithic concrete, put in place under the engineering supervision of C. E. Leslie. Recent inspection of the completed job reveals a high type of work, one inspector comparing the finished concrete to fine statuary because of its even texture and smooth finish. Laboratory tests conducted throughout construction have shown an average 10-day concrete strength of 2,700 pounds per square inch.

At the inception of the work, while the temperature range was still well above freezing, a volume mix of 1-2-4, with five gallons of water to the sack of cement was used. A Ransome 2-sack electric concrete mixer was used, with a gasoline 1-sack Rex mixer for use during rush times or delays at the larger mixer. With the coming of cold weather the mix was adjusted to 1-1½-3 and the mixing time extended to full five minutes, no change being made in the water-cement ratio. All aggregate and mixing water reached the mixer at a minimum temperature of 150 degrees, so that, even on the coldest day and after considerable chuting, the concrete reached the forms at about 80 degrees. The chuting equipment was a locally constructed 145-foot tower hoist with a locally constructed chute of elliptical shape. Concrete was spotted to a platform from where it was carted to the forms.

While much excellent concrete has been placed in cold weather with little protection, it was felt that the Goetz job justified complete protection. The contractors, E. H. Lawhorn Co., provided coils and grills for heating water and aggregate, a hundred 16- by 20-foot pieces of canvas with which to enclose the green concrete and a battery of coke-burning salamanders, one salamander being placed in operation for each 300 square feet of concrete. So equipped, the builders were able to maintain a constant temperature of 70 degrees about the fresh concrete for a period of ten days after casting.

Tight control was exercised by the builders in every important aspect of the construction. The coarse aggregate, Bethany Falls limestone, was repeatedly cleaned and graded, while the Kaw River sand was tested and analyzed before and after shipment. A uniform 2-inch slump was maintained in the raw mix, checked by frequent tests. Sample test cylinders were made up each day and set aside for testing at predetermined intervals.

The result, in strength and appearance, is considered as ample justification of the precautionary measures taken. The small extra expense incurred in carefully controlled cold weather construction on this $300,000 job is viewed as an excellent investment, in view of the fact that earlier occupancy of the new space gives the owners a distinct commercial advantage.



Goetz Brewery, St. Joseph, Mo., Showing the Hoisting Tower and Chute, Cold Weather Protection, Sand Stock Pile, With Steam Pipe at the Right-Hand Corner, Concrete Slab Floors and Columns. The Temperature was 3 Degrees Fahrenheit When This Photograph was Taken

This is an excellent example of the rapidly increasing number of winter construction projects which but a few years ago would have been considered impossible. Proper care in the selection and proportioning of aggregate is essential at all times, but in winter a bit more makes the season longer and more profitable.

A 6-Mile Bituminous Macadam Job

Ralph King Memorial Highway Built by Private Funds at Chardon, Ohio

AN organization full of spirit, and including many World War veterans, was gathered by N. B. Putnam, Columbus, Ohio, to build the 6-mile bituminous macadam job northwest from Chardon, Ohio, under the superintendency of Edgar Putnam. The contract financed by the estate of the late Ralph King, his friends and the county as a memorial was handled under the direction of the town and Highway Department of Geauga County. The contract included the grading, drainage structures consisting of about 14 culverts, and an 18-foot paved way of bituminous macadam.

Work on grading was started October 1, 1927 and continued until December 1 when it was closed down by the cold weather. Grading and bridge work was started again about May 1, 1928, and paving of the portions graded in 1927 began at the same time. Grading was completed on June 16 and the paving finished August 15.

Grading Operations

The heavy grading was handled by a Thew type-O steam shovel, and a 12-foot Adams, and a 10-foot Galion grader hauled by a 10-ton Caterpillar tractor. For hauling the earth from the cuts to nearby fills Hug trucks were used and in most cases backed to the fill as the subgrade was wet from the incessant rains of the early spring. The subgrade was rolled by a 2-cylinder Galion roller which was also used on the slag base and surface.

The total cut was about 42,000 yards including 2,000 yards of rock. The cut was entirely used as fill and there were about 1,500 yards of borrow all of which was taken from a creek bed at the request of one of the backers of the road. The material changes rapidly over the job varying from gravel to clay and sand several times in a mile of road.

Slag Unloading Plant

No. 1 slag, ranging in size from 2½ to 3½ inches, as well as the slag dust or screenings was unloaded at a spur of the Baltimore & Ohio near Chardon, giving a haul of one to six miles. The slag was purchased from the Standard Slag Co., Youngstown, Ohio, and was delivered in hopper bottom cars. The siding was on a slight down grade which made it possible for the Maccar and Relay trucks which were used to haul the slag to the road to spot the cars at the Galion unloader with a minimum of effort. The foreman at the unloader kept the trucks moving rapidly getting each truck loaded in about 1½ minutes. The average time for unloading a car during the job was about one hour.

The trucks were equipped with governors to control the road speed. There was much good-natured rivalry between the various truck drivers as to who would turn in the largest number of loads delivered each day. The use of governors prevented racing on the rough grade and protected the trucks from undue wear, thus lengthening the life of the units representing an appreciable investment and greatly reducing repair costs and the chances of accident.

Bituminous Macadam

Three men were engaged ahead of the spreaders lay-

GRADING OPERATIONS ON THE COUNTY HIGHWAY NORTHWEST OF CHARDON, OHIO

1. A Type-O Thew shovel used on the heavy cut. 2. Hug truck dumping after backing about 500 feet from the Thew shovel seen in the background. 3. Grading with a Russell Super-Mogul blade grader hauled by a 10-ton Caterpillar tractor. This outfit easily cut roots up to 4½ inches in diameter

ing forms of 2 x 4's and backfilling with dirt from the shoulders. The trucks from the unloader backed up to one of two Galion rock spreaders, hitched on and dragged the spreader ahead until the truck body was empty. This operation was done with amazing rapidity, there seeming to be considerable rivalry among the truck drivers to see who would turn in the largest number of truck loads a day. In fact the only complaints heard on the entire job were that certain of the truck governors cut off at speeds a mile or two an hour under the fastest truck.

Immediately after a section was spread a 4-cylinder Galion roller packed the material which had been gone over carefully by two men with stone rakes. Following this rolling five men quickly cast slag dust or screenings over the surface and the roller with a wire brush attached rolled the surface until it was bound tightly. The second 4-inch course was handled similarly.

As soon as the base course was complete for the entire six miles work was begun on the oil asphalt top. A No. 2 slag was used for the 2½-inch penetration top. This material varies in size from 1½ to 2½ inches. The asphalt was applied at the rate of 2½ gallons per square yard by the makers trucks at a temperature of about 325 degrees Fahrenheit. Following the treatment the road was immediately covered with hand-cast No. 4-(¼ to ¾-inch) chips and rolled with both rollers.

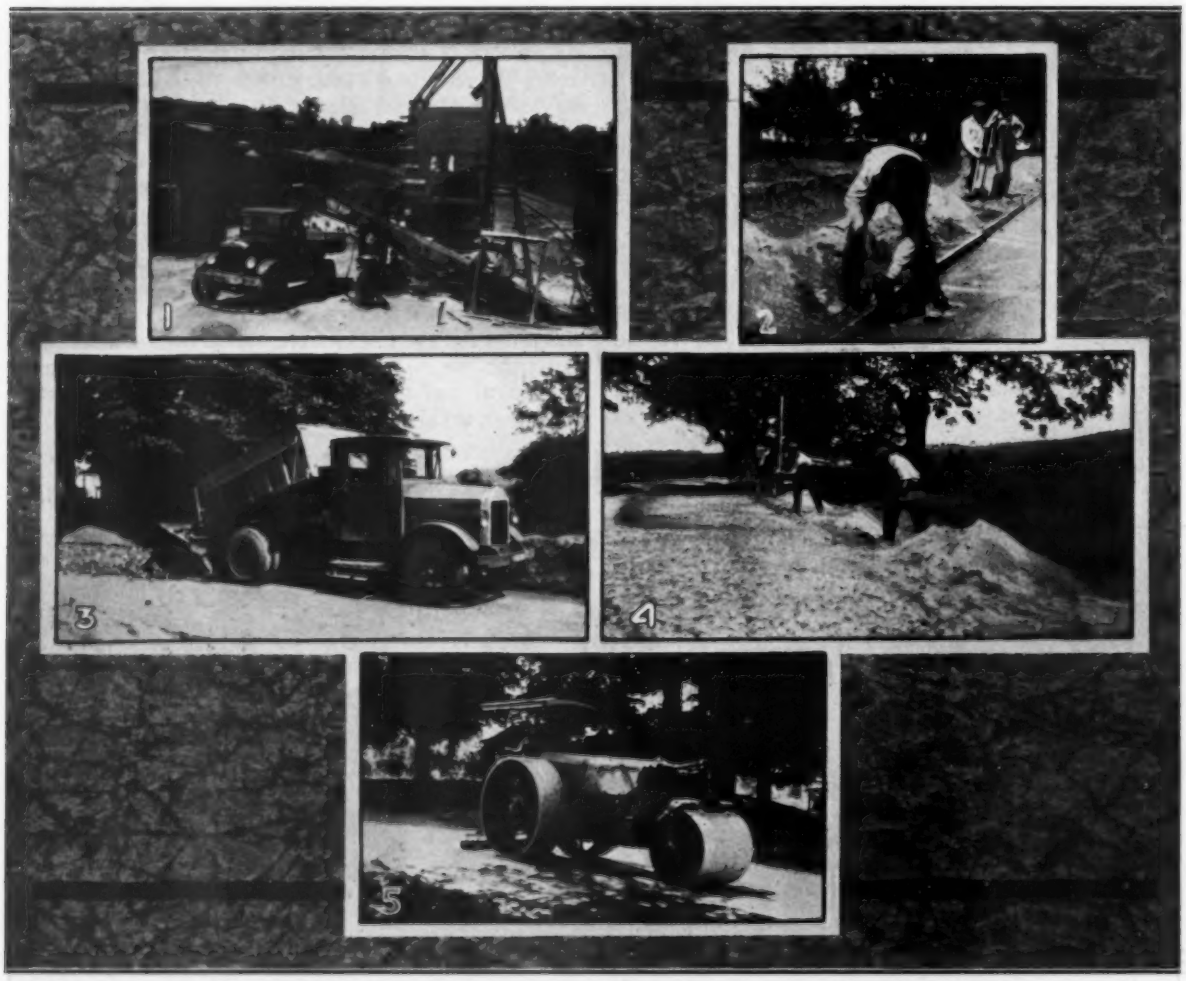
The seal coat consisted of a 0.7 and 0.3 gallons per square yard asphalt treatment covered with No. 6 (¼-inch) chips and rolled.

The job required about 31,000 tons of slag which weighs 2050 pounds per cubic yard on the average, and 157,000 gallons of asphalt.

The completion of the job included the placing and grading of the 5-foot earth shoulders and the 27-inch ditch which was handled by the grader and Caterpillar tractor.

PERSONNEL

The work was carried on under the direction of Inspector W. Payne and Engineer Walter Marks assistant to E. A. Fiedler, County Surveyor and Engineer. Edgar Putnam was Superintendent for the contractor.



LAYING THE NEW BITUMINOUS MACADAM ROAD NEAR CHARDON, OHIO

1. Galion unloader delivering slag from track pit to a Relay truck. 2. Setting forms of 2 x 4 timbers for the slag ahead of the spreaders. 3. Maccar with St. Paul hoist spreading slag with a Galion spreader. 4. Hand casting of fine slag preparatory to final rolling. 5. Galion gas roller with steel brush compacting slag after hand casting of fines

Handling Misfires in Open Work and Tunnels

The Cause and Remedies for Misfires in Blasting Operations of Various Kinds

HANDLING a misfired hole is not a source of worry to the average blaster, nor does he give it any thought. If he has a hole fail he generally does whatever comes to his mind first and in almost every case, the thing he does is very dangerous. This is all wrong, according to H. H. Hamilton, Technical Representative of E. I. DuPont de Nemours & Co. Handling a misfire is by far the most hazardous duty any blaster is called upon to perform and he should proceed with every precaution for his own safety and that of other men on the job.

In the first place, a large percentage of the misfires which occur could be prevented by making up the primers more carefully and, when electric firing is in use, by taking more time and pains with all the final connections. Most blasters are in a hurry just before firing a shot and this is the very time one should make haste slowly. When a misfire does happen, however, some steps must be taken. What can they be with the least risk?

Misfires in Open Work

Let us consider failures of well-drill holes. Fortunately, there are but few of these. When a well-drill hole does fail to fire, it falls into one of two classes: first, holes that are so located that the total charge can be fired without danger to life or property; or, second, holes which the original shot has robbed of part or all of their burden, so that the firing of the charge would be a hazard.

In the first place, if the detonator is a good one and the wires are uninjured, the failure having been due to poor connection or insufficient current, the charge can usually be fired by a second application of the current. If this fails, the next expedient is to insert a fresh primer. The safest method of doing this depends on the material used for tamping. The depth of tamping should always be known for no good blaster would ever load a well-drill hole without measuring and recording the depth of tamping. If the stemming material is clay or loam it is possible to take a pointed wooden pole or a piece of pipe with a sharpened wooden plug in the end and work a hole down through the tamping to the top of the charge and then push a new primer down through this hole until it rests on the charge. Water should be poured around the pole all the time the hole is being punched.

Removing Stemming of Sand or Screenings

If the stemming consists of sand or screenings, it is not easy to put a hole through it and the stemming must generally be removed from the hole. This can be done easily with a prospect auger or a small post hole digger. Sand prospect augers are made in diameters of from 3 to 5 inches and are furnished with ¾-inch pipe fittings, so that pipe can be screwed on to form a handle of any length desired. In using such a tool, however, care must be exercised as the charge is neared so as not to bore into the explosive. After the stemming is removed, a new primer is lowered into the hole.

Sand stemming can also be blown out of a well drill hole by compressed air. The best method of doing this is to put down a 2-inch pipe in the center of the hole and blow out only the sand which rises in the pipe. This pipe serves as a sort of caisson and should be left in the hole to prevent the remainder of the sand from falling in. The new primer is pushed down through the pipe until it is in contact with the original charge.

If the explosive is loaded solidly in the well drill hole, a fresh primer can generally be relied upon to explode the whole charge, but if the load is broken, firing a fresh primer on the top charge would probably explode only this charge leaving matters in worse condition than before. Therefore, in case of misfire of a deck-loaded well drill hole it will probably be necessary to remove both tamping and explosive down to the bottom charge.

Removing Explosive

If the misfire falls in the second class referred to, namely, where the exploding holes have broken away the burden from the hole or holes that failed, it is likewise often necessary to remove part or all of the explosive. This is a dangerous operation at the best and should not be undertaken except by a competent and experienced man.

A tool which has been used successfully for removing explosive from a well-drill hole can be made as follows: Take a copper or brass tube 4 or 5 inches in diameter and about 20 inches long, have the edges of one end of the tube sharpened and have two holes drilled on opposite sides about half an inch up from this end. Then run a 14 gage copper or brass wire through these holes across the diameter of the pipe and fasten it securely. Have the other end of the tube fitted with a coupling to take ¾-inch pipe so that a handle can be attached of any length required.

After the tamping has been taken out of the failed hole with the prospect auger, this tube can be pushed down into the explosive. The explosive will rise in the

tube and when this is full the wire will serve both to cut the explosive off as the tube is twisted around and to hold the explosive in place until the tube can be lifted out of the hole and the dynamite removed. Then the tube can be put down again and the process repeated. A little water should be kept in the hole throughout the operation both to soften the charge and to prevent friction which might create sparks.

After enough of the charge has been removed to make firing of the hole safe, a new primer should be put in and the hole tamped. Water is the ideal material for tamping under these circumstances.

Sometimes the charges in the holes adjacent to the hole that fails break the rock to such an extent that the misfire is not discovered until the shovel digs into the bank and uncovers unexploded dynamite. In such a case the steam shovel and all other equipment which might throw sparks or might be damaged by an explosion, and all workmen, should be withdrawn immediately to a safe distance. Then the blaster or some other man who has had experience in handling explosives should carefully remove the broken rock, keeping a sharp lookout for loose explosives, until the bore hole containing the charge that failed is exposed. Circumstances alone can determine whether it will be possible to insert a primer and fire the entire charge, or whether some of it must first be removed before the hole can be fired, or whether the entire charge must be removed from the hole. Whichever course is chosen, the careful procedure described in the preceding paragraphs should be followed.

Misfires In Small Diameter Holes

In case of misfires in holes of smaller diameter than well-drill holes, it is generally necessary to remove the tamping in order to insert a new primer to fire the charge. This can be done by the use of a blowpipe and compressed air, or of water pressure, or of copper augers and spoons. The relative advantages and disadvantages of these methods as discussed in the next section apply equally to open work.

If a small diameter hole that misfires is a bench hole that has not been sprung, the best procedure is probably to drill another hole beside it, from one foot to two feet distant, depending upon the depth of the hole, and in such a position that a charge fired in the second hole will break the rock away from the first hole so that the unexploded dynamite can be recovered. A misfire of a sprung hole should never be treated in this way as there would be great danger of drilling into explosive in the chamber or in a crevice made by springing.

Misfires In Tunnels

The class of work in which misfires occur in the greatest number is tunneling. At one time, it was considered a more or less standard safety practice in such operations that in case of misfire a second hole should be drilled parallel to the missed hole at a safe distance away, never closer than one foot, and that this should be loaded and fired with the object of exploding the missed charge by concussion. If there is sufficient burden on the missed hole to make this feasible and if firing a second hole explodes the charge in the first, all is well, or, if the shot does not explode the first charge, but exposes the unexploded powder so that it can be recovered intact, this disposes of it safely. There is such grave danger, however, that unexploded dynamite will be thrown out and scattered amid the broken rock and later struck by a pick or shovel that some important companies have rejected this practice altogether. If the practice is followed, careful search should always be made in the broken material for unexploded dynamite. A second hole should never be fired alongside a misfired hole that has been chambered or in material where there are seams or crevices.

Use of Compressed Air

Today in underground tunneling operations in the general contracting field, the common procedure in handling a misfire is to attach a metal blowpipe to the compressed air hose, run the pipe in the hole, blow out the tamping and insert a new primer. This use of compressed air for blowing out tamping involves several dangers. It is practically impossible to know when all the tamping has been blown out and if the primer is at the top of the charge and the blowpipe strikes it hard, the detonator may explode. This can happen whether the pipe be of steel, copper or brass. Moreover, when the charge is a granular explosive, the force of air is more than likely to spread powder all along the sides of the hole for the blowpipe is smaller than the hole and it is impossible to stop blowing the moment the charge is reached. In a bore hole coated with dynamite the friction of the pipe as it is run up and down in the hole or the blows which the force of the air causes the pipe to strike against the side of the hole may easily start a premature explosition. Things that sound far fetched perhaps, actually happen with explosives. In one case, powder blown from the hole before the air could be turned off remained on an adjacent slab in sufficient quantity to explode when a workman struck the slab with a sledge and the man lost his eyesight. Instances are also known where some of the powder in a missed hole was blown by the compressed air into a crevice in the rock and was later drilled into and exploded.

When the missed hole is charged with gelatin dynamite the dangers of blowing out the tamping with compressed air are decreased but even then a metal blowpipe introduces a hazard. A substitute is a piece of stiff rubber tubing fitted with a coupling so that it can be attached to the air-line and also with a valve for controlling the flow of air. If it is desired to remove

Prevent Misfires

If sufficient attention is paid to the careful making up of primers and sufficient time and care is taken in making the final connections for electric firing, most misfires will be prevented. In cases where misfires do occur, the advice given in this article is invaluable and should be followed with painstaking care that a disastrous explosion may be avoided. As Mr. Hamilton says, "Things that sound far-fetched, perhaps, actually happen with explosives."

Always Be Careful.

the explosive after the tamping has been blown out, this can be done by working the tube around in the hole until the force of the air has loosened up the charge and then gradually withdrawing the tube. The cartridge or chunks of gelatin will follow the tube up the hole and in this way the primer can often be recovered and the cause of the misfire ascertained.

If compressed air is to be used for blowing out tamping, the hole should be kept drenched with water. This is especially important if the charge is a granular explosive and if a metal blowpipe is used. The work should be done only under the supervision of a foreman or shift boss, and the greatest caution should be observed.

WASHING OUT WITH WATER

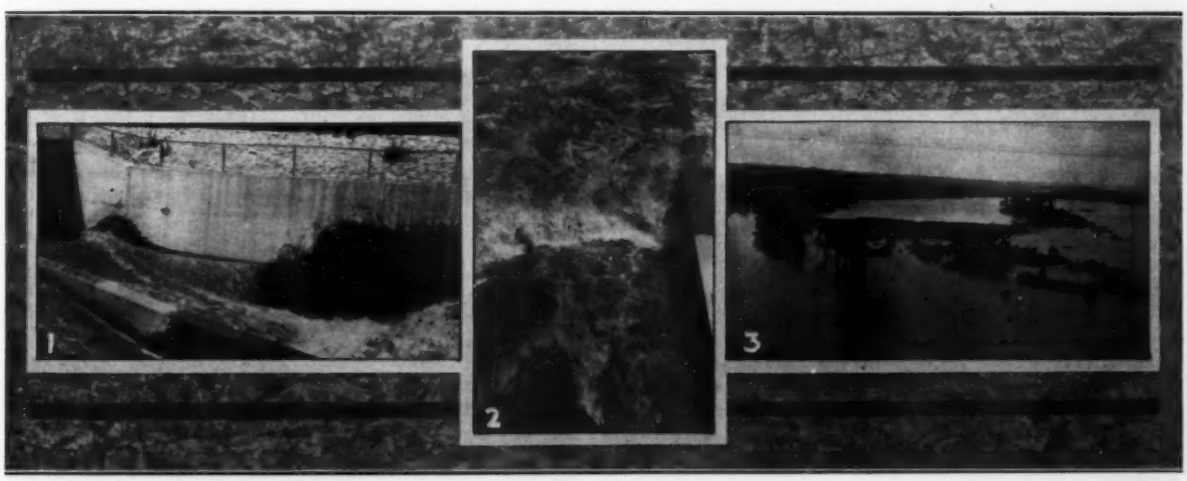
In general, however, the safest method of removing tamping from a bore hole, and the one strongly recommended, is washing it out with water under pressure. The tamping usually needs to be loosened up first and for this a tool being successfully used by two large companies is suggested. This is made from a copper rod ⅜ inch in diameter and about 6 feet long. One end is flattened for almost 6 inches to a width of one inch, and the tip is cut into the shape of a V and sharpened. This end is used for loosening up the tamping preparatory to washing it out with water. The other end is flattened for about 15 inches to a width of 1½ inches, this portion is heated and twisted somewhat like an auger and the tip is split like a coal auger and sharpened. This end is used for pulling out the tamping in case there is not sufficient water pressure to wash it out. The tamping is kept throughly wet while it is being loosened or pulled out. The companies referred to have standardized on a certain number of inches of tamping for every hole so that the blaster always knows just where the top of his charge is located. With the tool described a blaster can remove 20 inches of tamping in from 10 to 20 minutes, depending on conditions. Of course, ordinary copper augers and spoons may also be used, always, be it remembered, in conjunction with water, for loosening and removing tamping.

There was a time when only compressed air was available in many tunnels but the modern drills are all equipped for wet drilling and water is now found in almost every working place, and, in many operations, under considerable pressure. Water pressure is a much easier, quicker and safer means of removing tamping from a missed hole and should be used in preference to compressed air whenever possible.

National Safety Rules for Construction Industries to Be Prepared

THE American Engineering Standards Committee has invited the Association of Government Labor Officials of the United States and Canada and the Associated General Contractors of America to assume joint leadership in the establishment of national safety rules for the construction industry. This action follows the decision of a general conference of representatives of all groups concerned with construction to recommend the establishment of national safety rules as a means of cutting down the great loss of life in the construction industry in every part of the country. Successful experience in establishing safety rules for other industries, notably electrical and mining, will be applied to construction.

The actual work of formulating the rules will be in the hands of a sectional committee on which all of the major groups concerned with construction and accident prevention will be represented. The following organizations will be requested to name official delegates to the sectional committee: American Society of Civil Engineers, American Institute of Architects, American Institute of Steel Construction, Associated General Contractors of America, Association of Government Labor Officials, Building Officials Conference, Building Trades Employers' Association, Bureau of Standards, Department of Labor, International Association of Industrial Accident Boards and Commissions, Labor, National Association of Builders Exchanges, National Association of Building Trades Employers, National Association of Mutual Casualty Companies, National Bureau of Casualty and Surety Underwriters, National Safety Council and the Western Society of Engineers.



THE ENGLEWOOD DAM OF THE MIAMI CONSERVANCY DISTRICT NEAR DAYTON, OHIO—A HUGE CONSTRUCTION PROJECT WHICH WAS WELL BUILT AND WHICH HAS FUNCTIONED EFFECTIVELY

1. *The hydraulic jump as seen from the side.* 2. *The hydraulic jump from above.* 3. *Flooded area back of the Englewood Dam in the latter part of June,* 1928

Camp and Plant Sites for Paving Contractors

A HIGHWAY contractor must usually provide at his own expense space for building, storage yards, cement sheds, repair shops, or any of the other accessories necessary for the performance of his work. There is seldom room for these on the public highway but such room must be arranged for on farms or other private property adjoining.

A. H. Hunter, Engineer, Illinois Association of Highway and Municipal Contractors, says, according to *Alabama Highways*, that he recently heard of a contractor whose investment for plant facilities exceeded $5,000, and of another who purchased an entire farm, possibly finding this cheaper than to pay rent for sufficient acreage. In his experience, an estimate of $200 for rental of property required for a plant set-up would be the least that should be figured on.

There will also frequently be damages to pay because of the fact that, with 60 to 80 men at work, some are at times trespassing on private property and accidents and contingencies arise where it will be necessary to pay claims of owners.

Concerning sidings, Mr. Hunter says that only in rare instances are adequate sidings available. "Do not be tempted to utilize sidings available. "Do not be tempted to utilize one that does not fully meet your needs. The resulting loss from inconvenience and reduced production will be more expensive than if you had provided proper trackage at your own expense." The length of siding required will be slightly more than twice the length of cars necessary to supply the material for a maximum day's run. His experience during the several years has been that the investment for siding required for a highway job is in the vicinity of $2,500 to $3,000; but with allowance for material rented from railways which if returned, would result in a saving, the net cost averages about $1,500.

He believes that few contractors keep any separate account of the cost of delivering equipment, taking the equipment to a given point, unloading it, getting it into position for work and returning it, but thinks it should be estimated at $1,600.

Selling Service

THE following is reprinted by permission from *Ferguson Service*, published by John W. Ferguson Co., engineers and builders, Paterson, N. J., and New York City, which has sold winter construction to old and new clients for many years. An interesting article on a recent Ferguson job appeared in CONTRACTORS AND ENGINEERS MONTHLY in February, 1928, page 81.

THE STORY

Harvey Holt, Sr., had a knack of calling the turn on the business market—his market. When others were pessimistic, he was figuring on ways to beat the odds and he took advantage of the lulls to place material orders for future needs at low prices. It wasn't all luck—Holt, Sr., was a student of business reports, statistics and market trends.

From the time he took over the business in 1899, each year showed a gain—even 1907 and 1921. Nearly every year saw some expansion in his plant facilities and, five new buildings built between 1917 and 1924 were monuments to his judgment in anticipating the market and cashing in on his foresight.

In 1924, Harvey, Jr., showed up, fresh from college and a finishing trip abroad. Young Harvey's record was A-1 in athletics, 100 per cent in popularity with his classmates and friends and good enough to get by in his classes. Holt, Sr., was proud of his son's football and crew records, but he held him rather lightly as a prospect for the future head of the business.

He started him at the bottom—moved him from one department to another—several trips on the road selling in the hardest territories—noted with disappointment his late night parties when home. He was surprised that young Harvey made no suggestions—apparently had none of his father's wonderful sagacity that had put the business at the top. "I'll have to wake him up," he said, "and the sooner the better."

The summons came the next day—Harvey, Jr., sat across the desk from the father he loved and respected, and he sensed that he was to be put to the test. No time was wasted.

"Son, you've been out of college three years and I haven't had a recommendation from you for boosting the business and increasing our earnings. If I'm ever to make a successor out of you, it's time you were showing something. Make one worthwhile suggestion and I'll make you a director—just one good one."

"Dad, my hat's off to you. I always knew you were good, but I never knew how good you were until I got into the business. My road trips opened my eyes—the trade and our competitors think you have more brains than the rest of them put together. I've never dreamed that I would be able to beat you to a good idea. Of course, I've thought about the business—perhaps more than you guess.

"I've noticed one or two things—see what you think of them. First, in our rush season our competitors get orders that would come to us if we could make quicker deliveries then."

"That's so, Harvey, that's why I keep building—I'm figuring on another building next Spring."

"Second, I've noticed that nearly every spring and summer, we have had building going on, machines being shifted and things held up right when we were busiest. Why do you always do your building in the busy season? I know you're figuring on a good spring—we're going strong on material orders and you could use that new plant in April. Why wait until spring to build it?—we won't have it till next fall. Why not build it this winter?"

"You've got a good point, son, but I'm not sure it's practical. Show me."

"Fair enough, Dad, here's my plan. We get lower prices on our raw materials by making contracts when things are slow. Well, building material prices are soft in the fall—contractors can buy right for winter building—we get that benefit. Of course, building labor is plentiful in winter. Our own labor units are lowest when we have more applicants than jobs, so why doesn't that apply to a building operation in winter? The building contractor, with lower material costs, a greater labor supply and fewer contracts to figure on for winter—he's naturally going to figure close, the same as we would. It's a good time to build a building right, isn't it, Dad?"

"So far you're all right, son. But how about the extra cost of building in winter—men can't work as well in cold weather—and how about the risk of freezing mortar and concrete?"

"I know about that, Dad. I've been nursing this idea longer than you think. When the temperature gets low, the builders stretch canvas on the outside of the building—enclose it. Then they use coke stoves inside to maintain the right temperature. It's simple and doesn't cost them much. Whenever I passed a building job last winter, I stopped in and looked it over. And I talked to some of the manufacturers and their contractors. Some contractors make quite a drive for winter construction—one builder told me he has built more than 60 buildings in winter, and that of late years about a third of his contracts involve winter weather construction.

"Dad, it is practical—I can prove that part of it, and mortgage money is plentiful now. What I want you to see is that we can pick up six months' extra volume and profit by having the new building ready just six months sooner. That's my case."

"Not so bad, Harvey. Tell you what you do. The new building will be practically a duplicate of our last one. Get those plans out and get an estimate. See how it compares with our last costs. Maybe we will build this winter. Maybe I'll put it up to you. Not so bad—there's hope for you, son, a fresh mind sees things differently. I always figured spring was the time to build but come to think of it I would like to be in the new plant by April. If it works out, I'll make good my promise. Hurry along the estimate. Not so bad!"

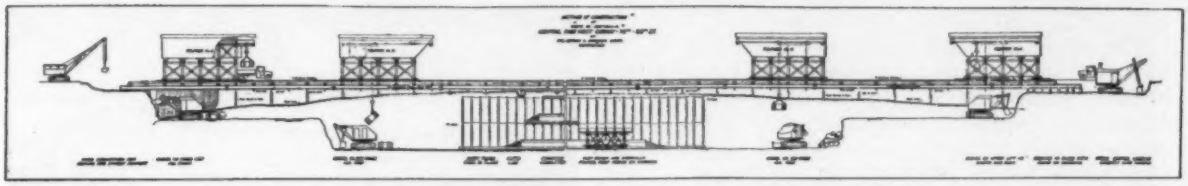
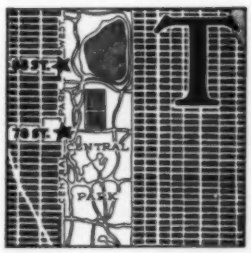


Diagram Showing the Method of Construction Employed on Section 1A of Route 78 of the Central Park West Subway in New York City by the Arthur A. Johnson Corporation, Contractors

Subway Construction Methods on Central Park West, New York

By Edgar A. Groves

Chief Engineer and Manager, The Arthur A. Johnson Corp., Contractors

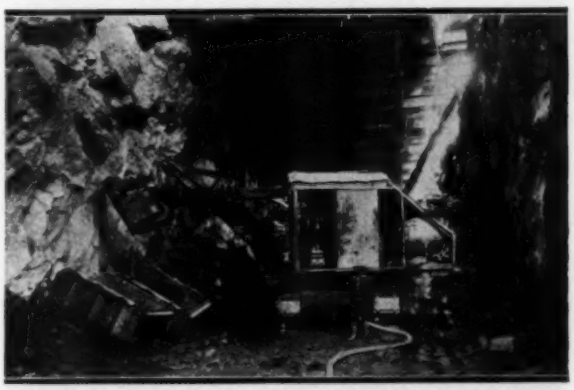


THE contract for Section 1-A, Route 78, Central Park West from West 78th to West 88th Street, New York, was signed June 22, 1925. Preliminary work of bypassing and plant erection commenced two days later, and work of excavation started early in September of the same year. The section is a 4-track double-deck structure throughout, 2,675 feet in length. The cut varies in depth from 38 to 41 feet and is 32 feet wide between stations, and 42 feet at stations. There are two stations each about 700 feet long, one at each end of the section. In the middle and deepest part of the job the work was almost entirely in ledge work, the rock being within 3 or 4 feet of the surface for several hundred feet, and falling off gradually toward each end, where the excavation is mostly earth. There was rock above subgrade, however, for the entire length of the work and for a considerable distance rock and earth were being removed in the same lift.

By-Passing Gas Pipe

As is the case with all subway contracts, gas bypassing was the first work to be done. This consisted in laying temporary gas pipe upon and above the street surface to replace those underground in the vicinity of the excavation in order to avoid the danger of ignition or explosion due to escaped gas which may be caused by jarring of joints or cracking of pipes due to impact of blasting in rock cut or settlement in earth cut.

Hand Excavation for Decking and Street Support



Bucyrus Air-Operated Tunnel Shovel Working on Subgrade in Rock Cut

Study of Excavating Methods

As soon as bypassing was sufficiently advanced excavation was started. From the beginning there was no doubt that the so-called new method of excavating would be employed, i.e., use of power shovels and whatever mechanical equipment could be employed to minimize the uncertainties of manual labor. The various methods of excavating were carefully considered, including the use of ramps and permanent shafts for the removal of the excavated material. The nature of the material to be excavated, the width and depth of the cut, and the desirability of taking out two separate lifts did not seem to adapt itself to the so-called "ramp" method, and it was decided to load the material into skips or scale boxes with Bucyrus 20-B power shovels, hoist directly from the loading point to the street surface, and dump the excavated material into trucks standing on the street. Derricks or revolving cranes were not considered suitable or safe for this hoisting, so a portable telpher was installed directly over each shovel.

PORTABLE TELPHER USED

The telpher consisted of a timber framework 50 feet long supporting a traveling cab electric hoist with 50 h.p. hoisting engine and 20 h.p. traveling engine. The framework spanned five bays of street decking and was so arranged that the bents coincided with decking and sheeting bents. With the telpher located over its shovel, three bays of decking plank and joists were removed and excavated material hoisted out in 3½ cubic yard skips from alongside the shovel and dumped into an auto truck standing in end bay where decking had not been removed.

DECKING SYSTEM

The principal part of the decking and street support consisted of a system of longitudinal and transverse

Shovels Nos. 3 and 4 Operating on the Subgrade With Shovel No. 1 in the Background on the Upper Lift

steel girder beams. There were two 24-inch Bethlehem girders, one on each side of the trolley tracks. Upon these girders rested the tracks and timbers supporting the decking. The timbers in turn supported 6 x 10-inch longitudinal joists, 24 inches center to center, to which was spiked the 4-inch hardwood decking. Decking excavation was carried to a depth of about 6 feet. As the top headings advanced behind the decked areas transverse Bethlehem girders were placed spanning the full width of the cut and resting on cribbing in hitches cut 5 feet behind the neat line of excavation. These were 20 feet center to center in the cut, with a width of 32 feet and 10 feet center to center in the station excavation, with a width of 42 feet. The business of decking was kept well in advance of the other

Method of Street Support and Timbering in Earth Cut

work and carried to such a state of completion in the first operation as to eliminate any delay to the heading excavating units on that account. The longitudinal girder beams were all placed at the time the street surface was removed, and were designed with a continuous splice and sufficiently strong to carry the entire decking load from the bench ahead of the shovel to the most advanced transverse girder beam behind or over the shovel.

EXCAVATION PROCEDURE

The object of the program adopted was to arrange that a maximum number of excavating units could be operated at all times—with system. The general procedure was to sink a shaft in the center of the section to about half of the finished depth and start a shovel and telpher. The telpher worked directly over the shovel, and as the heading advanced the telpher was also moved, 30 feet at a time, i.e., an even three bays. As soon as the excavation with this unit had proceeded far enough a second unit was started on the same level working in the opposite direction; there were then two units (shovels with their telphers above them, the telphers hoisting scale boxes and loading directly into trucks) working away from each other toward the op-

General View Looking North Showing the Four Telphers in Operation

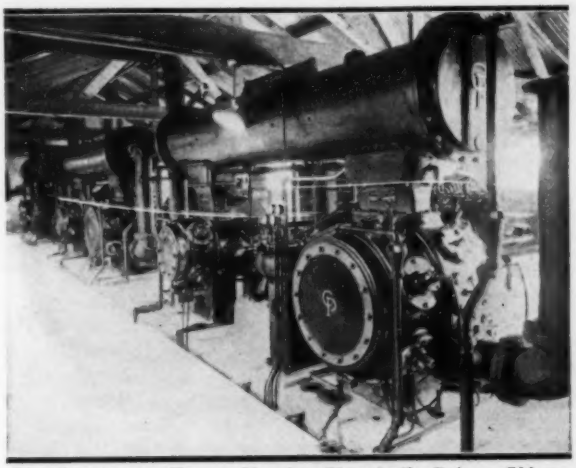
posite ends of the job, one in a northerly and one in a southerly direction. When these headings were about 200 feet apart a third shovel was put into operation midway between the two top headings, working down to sub-grade in a southerly direction. As soon as was practical a fourth shovel was started on the sub-grade working north. In all this period hand or power shovel excavation, whichever suited the conditions, was being pushed ahead, keeping decking and longitudinal girder beams well in advance of shovels No. 1 and 2. In places where the heading consisted of earth and rock, the overburden of earth was thrown down in front of the power shovel by hand, just keeping far enough in advance of the rock heading to allow for drilling. It was found in the deep rock headings that the shovel and hoisting operations in one shift were able to handle material removed by the drilling and blasting of two shifts. Separate units were used to take care of excavation for ventilators, station stairways, etc., which were not as deep as the main cut and did not require decking in advance of excavation to sub-grade.

A Blacksmith Shop With Ingersoll-Rand Oil Forge and Drill Sharpener

CONSTRUCTION NOT HINDERED

The above described procedure did away with the interference of transverse obstructions with the operation of trucks or industrial cars below the decking, as hoisting was done from directly alongside the shovel. Another important consideration was to devise a method of excavating such that as the excavation on the sub-grade proceeded the building of the structure could follow without waiting for a long stretch of excavation to be completed, such as would be the case in a narrow cut using ramps for disposal, or industrial track on grade hauling the excavated material from heading to shaft; the system of excavation devised for this work solved the problem and the excavation was carried on and the structure built without interference of one with the other.

Construction of the permanent structure was carried out on the same general scheme, the work starting in the center of the section and working toward both ends, the first section of invert being poured in approximately the same location as the first shovel started work. The invert was poured monolithic with track benches and the steel was erected on graded mortar

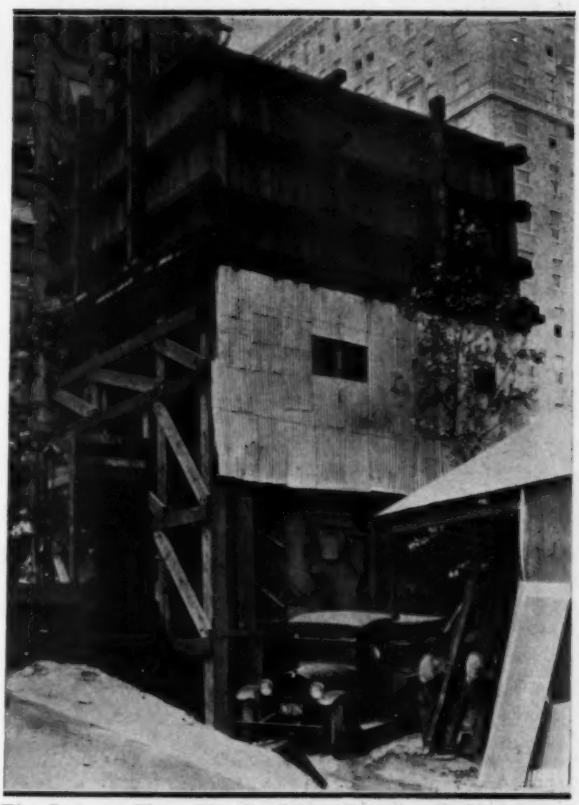


The Compressor House, Showing Electrically-Driven Chicago Pneumatic Compressors

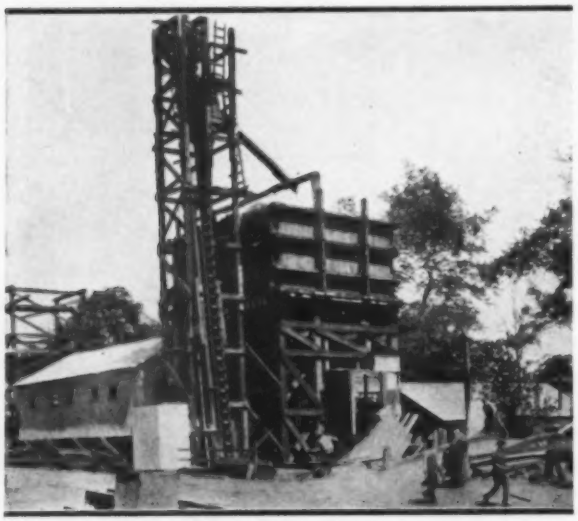
patties. After the steel was grouted the duct bank was laid and the bench poured monolithic with the lower part of the side wall. The lower side walls, track slab, upper duct bench, side walls and roof followed in order. Steel forms were used for side walls, track slab, and roof. Upper and lower level concreting was carried on together, and a 30 foot unit of steel form was used, carried on four collapsible carriages—one carriage to each track and each carriage extending the full length of the unit.

CONCRETING PLANT

In designing the concreting plant for this section



The Concrete Plant, Showing Mixer Dumping Batch of Concrete Into Graham Brothers' Truck



The Concrete Plant, Showing the Bucket Elevators for Sand and Stone, the Cement Shed and the Sand and Stone Bins

advantage was taken of the difference in elevation of the ground inside and outside of the park wall of Central Park and the only hoisting apparatus used was a Haiss bucket elevator to raise sand and stone to the 240 cubic yard timber bin 25 feet above the street surface. Cement was unloaded directly from trucks to the cement house, from where it was taken to the charging hopper of the mixer by an Alvy Ferguson gravity conveyor. A 28-S mixer was used, and fed from bin through a Blaw-Knox sand inundator and stone batcher. The mixed concrete was discharged directly into trucks holding one batch and hauled to the point of placing along the line.

Power shovels, rock drills, paving breakers, clay spades, etc., were all operated by compressed air supplied from a central plant consisting of three Chicago Pneumatic electrically driven compressors, each having a capacity of 1,309 cubic feet piston displacement, operating at 100 pounds pressure.

No underpinning of buildings was done, as the cut was sufficiently far away from the building line to render underpinning unnecessary.

Arthur A. Johnson is President of the Arthur A. Johnson Corp.; Edgar A. Groves, General Manager; Thomas Tully, Superintendent; and Charles B. Molineaux, Engineer.

Looking North on Section 1A, Showing the Invert Poured and the First Stretch of Steel in Place at the Point Where Excavation Started

Idle Construction Machinery Costly

LUIGI BUFANO is a wise contractor. He completes his jobs on time. He completes his contracts according to schedule. He and his men have a fondness for bonuses. He finds that he has on his hands additional time in which to undertake other jobs. He reaps a maximum return on his investment in equipment. Like the wise owl, he takes advantage of the time when other men sleep. He keeps his construction crews on a 24-hour basis. He uses a flood light.

The Oxweld Acetylene Flood Light Illuminating Night Construction Work

This flood light idea is not new to Luigi, of course. But weather conditions, sources of power available, and the size of the area to be illuminated were factors that entered into the question and had to be combated to make it worth while for Luigi to be so very wise. But he found a good acetylene flood light, with clear penetrating illumination, that does the work that formerly required a battery of flares.

One of its features that Luigi likes is its portability. He moves it from place to place by unskilled labor with no installation or other expense. Luigi likes this. It is shock proof. And it functions perfectly in freezing or torrid temperatures, resists winds of almost gale force and looks right through a rain or snow storm.

By using two crews—one for day and one for night work—the price of labor is not boosted as it might otherwise be by paying for overtime labor.

So now Luigi works twenty-four hours on his jobs. Suitable detours are not always available on road jobs, and consequently traffic must progress on an improvised road alongside the actual construction. Workmen are impeded in their movements and everything is slowed up generally. Concrete mixed during the day must be finished before it becomes too hard, and this means night work. So Luigi calls to his foreman to set up his flood light. He is going to complete his contract on schedule.

A Perplexing Wire Rope Problem Solved

By Oscar Hellgren

THE exact province of the varying kinds of "lays"—just what each means and where each belongs—is not so thoroughly understood as it should be in the construction field. To the old hand, of course, these terms are elementary. For many, however,—even extending to those in supervising or purchasing capacities—the terms that are so essential to intelligent use and application of wire rope seem only to contribute to clouded understanding and erroneous impressions. It is with the thought that much of this confusion might be clarified that I am setting forth the following facts.

Lang Lay Not a Trade Name

Perhaps it is not to be wondered that many engineers carry impressions similar to one operating friend of mine who believed that "Lang Lay" was a trade name signifying an individual brand of rope, or to a maintenance man of my acquaintance who seemed quite surprised to learn that "Tru-Lay" did not signify a particular type of rope that differed in construction from ordinary ropes.

At another plant an engineer was found who entertained the fallacious belief that "Right" and "Left" lay had no relation to either "Lang" or "Regular" lay; while yet a fourth friend of mine, a locomotive crane operator, insisted upon ordering his rope by such specifications as: "⅞"—6 x 9 Plow Steel," expecting the rope manufacturer to supply his order without delay or confusion.

What "Construction" Means

Just a word about the construction of wire rope may be helpful to many. The wire rope that is commonly employed for practically all commercial purposes is made up into any one of 42 different constructions and in any one of six varying metals. There are, of course, many more than 42 different and distinct constructions, but by far the greater percentage of all wire rope service is performed by one of the 42 standard constructions. These varying constructions are designated by names such as "Seale," "Spacer Seale," "Warrington," "Tiller," etc., etc.

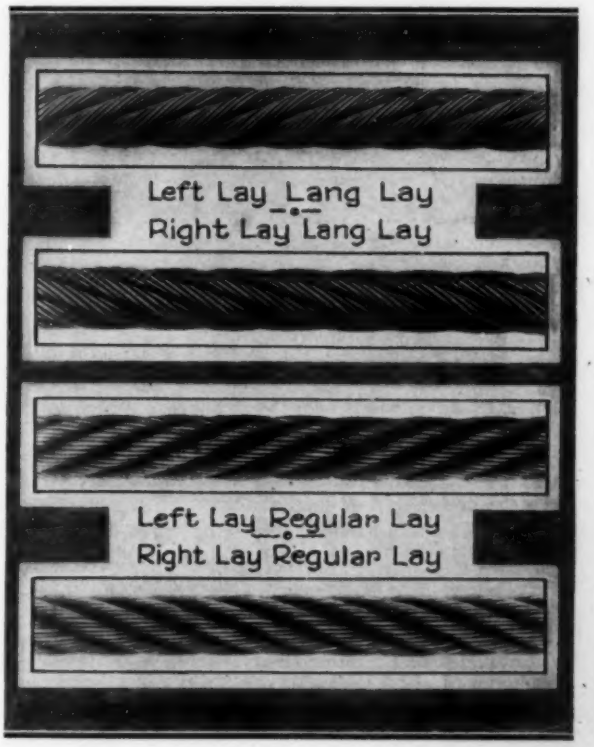
Practically all these several constructions are available in any one of six grades of material, which are: "Iron," "Toughened Steel," "Cast Steel," "Mild Plow Steel," "Plow Steel" and "Improved Plow Steel." While it is quite impossible to set up an arbitrary table of wire rope application to definitely limit the province or define the service of any one rope, it yet remains that each of these 42 constructions and 6 different grades have places where they serve best and other places where, because they would be misapplied, would fail to give their full service life.

In determining just which type of wire rope will best meet given conditions it always pays to consult a qualified rope engineer. Only through a knowledge of the working requirements and the condition of the auxiliary equipment can wire rope properly be specified.

Construction or grade of rope has no influence on its "lays," however. For instance, a 1¼-inch 6 x 19 Spacer Seale (which is to say: a 1¼-inch diameter rope that is made up of six strands of 19 wires each and in accordance with a construction known as "Spacer Seale") might be either Left Lay Lang Lay, Right Lay Lang Lay, Left Lay Regular Lay or Right Lay Regular Lay —or might be any one of those, plus Tru-Lay.

What "Lay" Means

"Lay" signifies the manner in which the individual wires and strands are *laid* into the completed rope. The rope that is most commonly used is that of "Regular" lay—so-called because the wires in the strands are laid in the opposite direction to that in which the strands are laid into the completed rope. This is illustrated in Fig. 1, and is commonly used in this country because, back in the old days when wire rope was forcibly twisted together rather than preformed (which meant locking within the rope a great deal of torsional stress) the internal stresses worked in opposition, in one direction in the strands and in the opposite direction in the com-



pleted rope, with the result that the stresses did much to equalize themselves and make the rope less likely to kink, much less "cranky" and easier to handle than would be the case if both strand and completed rope stresses were pulling in one direction. Whether the rope be Left Lay Regular Lay or Right Lay Regular Lay depends entirely on whether the strands are laid into the rope clockwise or counter-clockwise.

In an effort to provide the individual wires with a greater wearing surface and gain a more flexible rope,

the principle of laying the wires and the strands was reversed. That is to say, the strands were laid into the completed rope in the same direction as were the wires into the strands. Fig. No. 1 illustrates this type of rope also. This is called "Lang Lay" rope.

As might be expected, this "Lang" lay rope offers several advantages over "Regular" lay ropes, chief among which are:

(a) Greater wearing surface, each outer wire having approximately three times the length exposed for wear. (See Fig. No. 2.)

(b) Greater flexibility, because the outer wires of the strand are parallel to the axis of the rope against the manila core and therefore set up less frictional resistance between themselves when bending.

(c) Lower bending stresses, the bending stress in a Lang Lay rope being approximately 80 per cent of that in a Regular Lay rope of the same construction and length of Lay.

However, there are several disadvantages to Lang Lay over Regular Lay rope, two of which are:

(a) When using Lang Lay it is absolutely essential that all auxiliary equipment (sheaves, etc.) be in the best of condition since a pinching sheave, for instance, will more readily deteriorate Lang Lay than Regular Lay rope. It will be obvious that to squeeze or pinch a Lang Lay rope—where the wires within the strands lay in the same direction as the strands within the rope—will more readily force the wires or strands to lift out of their proper place. This is called "bird caging"—a fault common to Lang Lay ropes that are made in the old way.

(b) By reason of the unopposed internal torsional stress in the non-preformed Lang Lay rope it has a great tendency to kink, be "cranky" and hard to handle. In addition, it will "bird cage" more readily than Regular Lay and because of this fact is quite unsuited to tasks where there is a need for elasticity or sudden stopping and starting. In oil well drilling, as an instance, Lang Lay rope would be unsuited to the work of drilling because of the liability of the rope to "bird cage" due to the oft-repeated sudden jars.

As in all ropes, Right Lay Lang Lay or Left Lay Lang Lay may be determined by whether the strands are laid in the rope clockwise or counterclockwise.

The word "Tru-Lay" does not signify a rope of a particular construction or grade. Rather, it indicates a method of wire rope manufacture, it being a "coined" word meaning "truly laid." Rope fabricated after the method indicated by "Tru-Lay" is rope in which both wires and strands are preformed before being assembled into the completed rope. This preforming process of "laying together" of the component wires and strands, in opposition to the old twisting process, was designed to eliminate the internal torsional stresses characteristic of twisted rope, and to compel each wire and strand to lie flat in its assigned place with little or no tendency to high strand, kink, bird cage or be "cranky." Having eliminated these faults, Lang Lay rope made according to the preformer or Tru-Lay process becomes much more practicable for use than ever before. Tru-Lay Lang Lay rope, with its absence of crankiness or tendency to kink, has its inherent advantages of flexibility, greater wearing surface of wires (as compared with Regular Lay Tru-Lay) and reduced bending stresses immediately brought to the fore front. With proper auxiliary equipment many wire rope users will find economy in a change from Regular Lay to Lang Lay because of this fact.

How to Order Wire Rope

Probably every wire rope manufacturer is repeatedly receiving orders which read something as follows: "Please ship us 242 feet of ⅝-inch Improved Plow Steel rope," or—"Ship by express 80 feet of ⅞-inch Seale." Such orders cannot be filled until more information is secured as to the type and kind of rope required. And when a user has an elevator stalled or a locomotive crane laid up for want of a rope the delay involved in obtaining more information is frequently very costly. Taking a few pages from my long experience regarding the proper method of ordering wire rope may save some reader a costly and aggravating delay.

In ordering wire rope there are nine distinct pieces of information required. These are:

1.—Length of rope.

2.—Diameter of rope. (Before replacing an old rope it is always well to gauge the sheave to ascertain whether it has been worn to an extent that will cause excessive abrasion or pinch the new rope. New sheaves are cheaper than wire rope.)

3.—Numerical construction—the number of strands by the number of wires in each strand. For instance: 6 x 7, 7 x 9, 6 x 19, etc.

4.—Type of construction—such as Seale, Spacer Seale, Guy, Warrington, etc. If in doubt or ignorance of the exact construction, consult a qualified wire rope engineer.

5.—Grade—whether Plow Steel, Improved Plow Steel, etc.
6.—Direction of Lay—whether Right or Left.
7.—Type of Lay—whether Lang or Regular.
8.—Type of core—whether hemp center or independent wire rope center.
9.—A full description of the class of service for which the rope is intended.

Where more than one rope is used on a piece of equipment, specify which rope is required, as: a boom rope or a hoist rope on a revolving shovel.

Where written properly the order that originally might have read: "242 feet of ⅝-inch Plow Steel rope," would more correctly read: "242 feet—⅝-inch 6 x 19 Warrington, Plow Steel, Left Lay, Regular Lay, with hemp center. This is to be used for hoist line on derrick."

If wire rope users will order their rope in accordance with the specifications they will save themselves many costly delays and assure themselves a more uniformly high average of rope service.

Mr. Oscar Hellgren, the author, is a wire rope splicer at the East Chicago Plant of the Youngstown Sheet and Tube Co. The illuminated initial at the beginning of this article shows a Christmas tree he made entirely from wire rope.

First Steel Industrial Building to Be Welded by a Structural Steel Fabricator

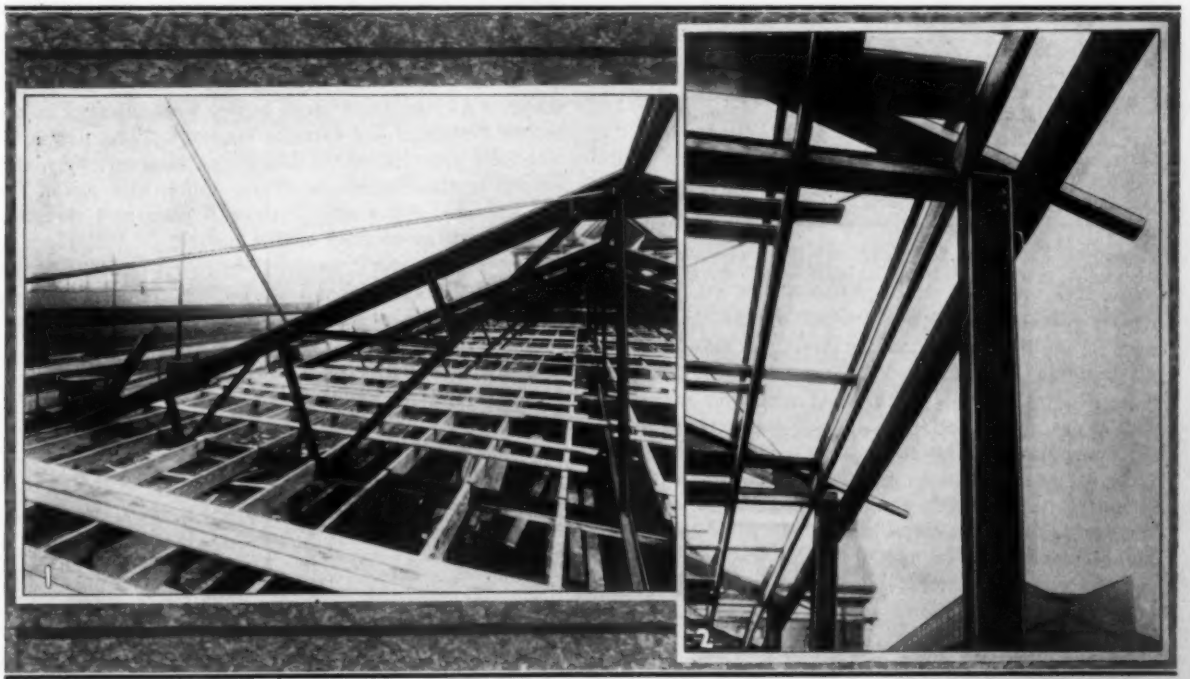
UNTIL recently all welded steel structures have been either promoted, fabricated or erected for or by companies manufacturing welding machines or equipment and who have interested themselves financially to promote the product in the publicity such buildings would obtain. To the Thew Shovel Co., Lorain, Ohio, goes the distinction of being the owner of the first industrial building whose steel framework was arc welded by a structural steel fabricator on a purely commercial basis.

Although the building is only a one-story structure of approximately 35 feet x 100 feet, its design is interesting due to the method employed in fabricating the various structural members. Six trusses of the Fink type, supported at the ends by 6-inch, 20-pound H section columns in the side walls carry the roof load. These trusses and columns were fabricated by electric arc welding in the shops of the Republic Structural Iron Works, Cleveland, Ohio, using Lincoln stable arc welders. By welding the truss instead of riveting it the gusset plates were eliminated except at the bearing ends and at the hip. The only punching required was for the bolted field connections.

The steel fabricators found in assembling the trusses that one welder operator consumed a trifle less time for welding a truss than a 4-man rivet gang would have required to rivet it. Actual savings by use of welding was at the rate of $1.50 per hour on the truss fabrication.

Another saving was effected by welding the base plates and caps to the columns. Thus, the use of connecting angles and the punching of angles and plates necessary for rivited construction was dispensed with.

A novel method of placing the roof trusses was employed in the erection of the structural steel work. The Thew Shovel Co. used one of its own products, a Lorain-75 crane, to lift the trusses into position.

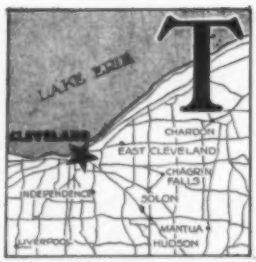


VIEWS OF THE FIRST WELDED BUILDING ERECTED ON A PURELY COMMERCIAL BASIS

1. Half of a symetrical arc-welded truss in position on the new Thew Shovel Co. building. 2. Arc welding eliminated the use of angles for connecting the column to its cap or truss bearing plate

Alterations to Old Steel Building Made Without Disturbing Tenants

New Framework Silently Joined to Old by Electric Arc Welding On $500,000 Job



TENANTS of the 10-story Rose Building, Cleveland, Ohio, are carrying on business in their regular manner undisturbed by alterations to the building which will cost approximately a half million dollars when completed. It is said to be the largest building operation of its kind ever attempted in Cleveland.

This office building, which houses mostly physicians and dentists, was erected in 1898-99. Because of its obsolete design many difficulties were encountered by William Robert Powell, Architect, and Carson G. French, Structural Engineer, of Cleveland, in the preparation of plans for the present alterations. One

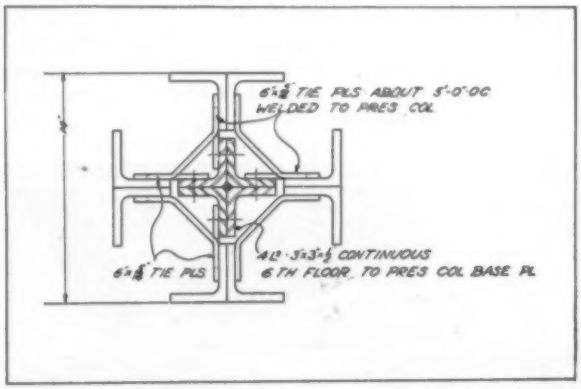


Figure 1. Plan of a Gray-Type Column Made of Four T Shapes, Showing Method of Reinforcing by Welding

of the greatest difficulties presented was the loss of most of the drawings showing structural details of the old building. The obstacle was overcome by the decision to cut the steel in the field whenever necessary, with a gas torch, and to make all connections to the old framework by the electric arc welding process.

By use of this modern method of joining steel it was necessary to make only small openings in the old walls uncovering only the face of the old steel where the connections were to be made. In this way much wrecking was eliminated, and, due to the fact that the arc welding process is silent, tenants of offices adjoining the building operations were unmolested. In fact, teeth are being filled and ailments treated in rooms adjacent to where the welder operator is welding. It is estimated that the owners of the Rose Building are saving thousands of dollars in rentals by the use of arc welding for making field connections.

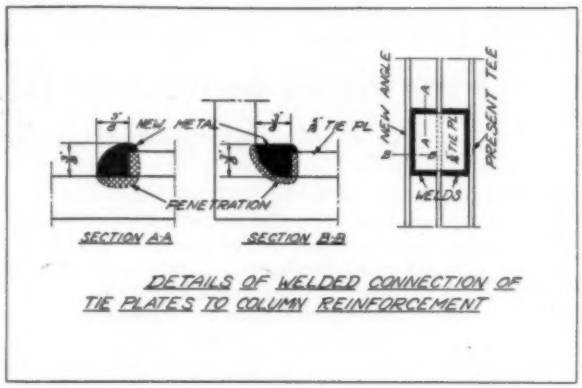


Figure 2. Welding Details in Reinforcing Gray-Type Column

Included in the alteration project is the addition of four stories on top of a portion of the building which was originally six stories high. The old columns in this section of the building were not originally designed to carry additional load. They are of the Gray type, made up of four T shapes held together by straps riveted to the legs of the Ts, thus the columns were given a circumference octagonal in shape, the center of the columns being open. To stiffen these columns and give them greater load bearing capacity, sections in the shape of a cross made up of angles were inserted in the hollow center of the existing columns. The new steel was then joined to the old at 5-foot intervals by plates welded to the legs of the angles and to the legs of the old Ts. Figures 1 and 2 show a plan and elevation of a column reinforced in this manner.

Where the 6-story columns were continued with new steel for the 4 additional stories the connections were electric arc welded as shown in Figure 3.

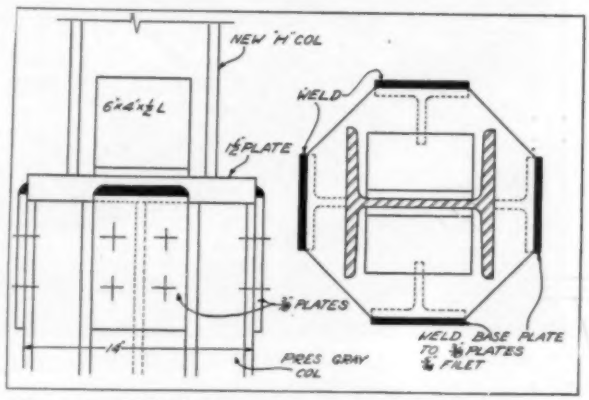


Figure 3. Welded Connections Between the Six-Story Columns and the New Steel for the Four Additional Stories

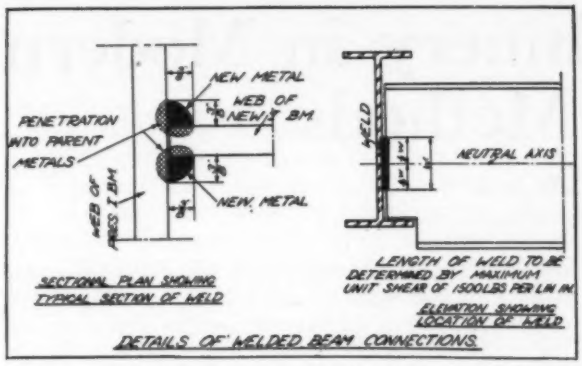


Figure 4. Welding Details in Framing in the New Elevator Well

New elevator wells were made in the old building. In framing these in, the new steel was cut to size with a gas torch and then butt welded to the existing beams with the electric arc as shown in Figure 4. Cutting with a gas torch and fitting was due to the fact that the old beams could not be located from the available drawings of the old structure and, as mentioned before, it was found to be more economical to cut and fit in the field rather than uncover the beams for accurate dimensions at the time structural drawings were made. Figure 5 shows arc welded connections where new beams were inserted to relieve old beam of additional load.

The beams which carried the roof of the low section of the building were not deemed to be of sufficient size to carry the seventh floor. To give them the necessary strength track rails were welded to the top flange of the existing beams as shown in Figure 6.

Welded steel bar joists are being used in the new addition. These are held in position by welding the ends of each joist to the beams. The joists are tied transversely by welding a half inch round rod to their bottom chords.

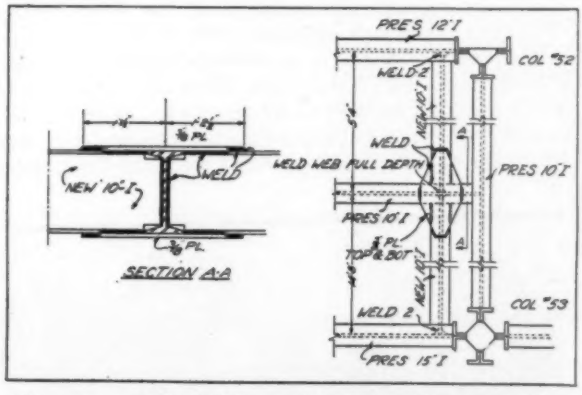


Figure 5. Arc Welded Connections Where New Beams Were Inserted to Relieve Old Beams of Additional Load

Arc welding is also being used by the plumbing contractor, The Smith and Oby Co. of Cleveland. Sections of 10-inch pipe which form the main steam riser are joined together by arc welding. The new process eliminates the use of threaded connections and fittings. The pipes are simply butted together and welded. Pipe joints made in this manner are said to be tighter and resist corrosion far longer than threaded connections. This new method also is more economical when the elimination of all threading and use of fittings are taken into consideration.

The actual labor savings effected by use of arc welding in place of riveting on this project cannot be accurately estimated due to the fact that in many instances conditions prevented the possibility of employing the older methods of joining the steel.

The Forest City Structural Steel Co., fabricators and erectors of the structural steel for the Rose Building used Lincoln Stable-Arc welding machines in doing the field work. Operators were required at intervals to weld samples which were tested to satisfy requirements imposed by the local building commission.

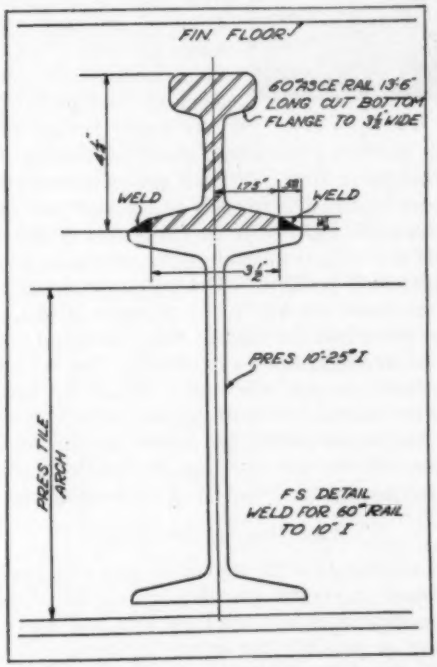


Figure 6. Scheme for Welding Track Rails to the Top Flange of Existing Beams to Strengthen Roof to Carry the Seventh Floor

The Blaster's Handbook

A NEW and revised edition of this handy-size and worthwhile volume has recently been issued by the Explosives Department of E. I. duPont de Nemours & Co., Wilmington, Del., under the direction of Arthur La Motte, Manager of the Technical Section. Among important new matter which appears in this edition is a section devoted to descriptions of the character and uses of pellet powder, a relatively new type of explosive so far as the United States is concerned. There is also a description of the low density duPont Extra Dynamites which are designed to reduce explosives costs in blasting soft ore, soft limestone, salt, gypsum and clay and of Agritol, a similar explosive for agricultural blasting.

The section on electric firing shows a new type of delay electric blasting cap and gives examples of the method of calculating the electric current required for firing various types of blasting circuits. The sections devoted to tunneling have been revised to include various new practices developed. Especially interesting is the discussion of methods of safeguarding electric firing underground against the hazards of premature application of the current to the blasting circuit and of the passage of stray current into the circuit.

Construction Machinery in Modern Building Methods

By R. C. Wilson

Vice-president, Turner Construction Co., New York

CONSTRUCTION machinery makes possible the great structures of the present day. The pyramids were built by manpower, unaided by the help of great machines, and the construction of each one consumed the lives of an army of slaves working through many years of back-breaking toil.

As years go on and time and the services of workmen grow increasingly in value, the necessity of time and labor saving devices are more and more essential if work is to be done promptly and at a reasonable cost. The company that is able to most increase the output of each of its employes finds itself in a preferred position. The costs are lower and the time consumed on any piece of work is less. It has been more or less the custom for a company to entrust to its Superintendent of Construction the selection and arrangement of the machinery which he believes is proper for the piece of work he may have in hand. The larger companies which are bound to carefully study their costs if they are to maintain their leadership have come to question the wisdom of such an arrangement.

The Day of Specialists

This is an era of the specialist and now the general practitioner does not go very far in his field. The average Superintendent is a busy man and does not have the time or possibly the talent to become conversant with all the different kinds of complicated machinery he now finds at his disposal, nor can he decide in an offhand manner which of all the machines will best handle the different parts of the work. He needs the help of a specialist to guide him in properly equipping his job with suitable plant.

The Plant Engineer

The really valuable Plant Engineer, if so we wish to call him, has to be a man of varied talent and wide experience and is a hard man to find. He may not need to be a mechanical genius, but must have much more than ordinary knowledge of machine design and operation if he is to be able to devise and supervise the buildiing of any special machinery that his company may need. He must be conversant with modern methods of construction if he is to have the confidence of the men in the field. He must understand modern machine shop practice if he is to make proper selection of machinery so that maintenance costs in the shop are not to be exorbitant.

Determination of Necessary Plant

The object of any labor saving machine is to reduce the cost of the work and save time. Machinery costs money to buy or rent and also to install, maintain and operate. These items of cost are just as much a part of the total cost of the work as are the charges against the job for lumber or cement or the wages of the workmen. When a company procures a contract for a piece of work it is its natural desire to have that work completed in the shortest possible time and for the least cost that still permits of such completion in a manner strictly in accordance with the requirements of the plans and specifications. The Superintendent and the Plant Engineer, if there be one, are faced with this problem—what machinery and how much may the job in hand need, so that the ultimate cost of the work is a minimum.

Decision without careful consideration has no place in this problem. Many factors have to be taken into consideration such as the cost to the job of the contemplated machinery in the form of plant rental, the cost of its installation, maintenance and operation. These are the charges that must always be related principally to the savings made in labor costs and in time and to a lesser degree in materials. Unless such costs are proved to be considerably less than the savings accruing therefrom, good judgment has not been used in the selection of the plant equipment. The principal savings as stated above are to be found in labor costs and time and so it is obvious that where labor rates are high it is proper to spend more money for equipment as the field for saving is larger. The average piece of construction work has a completion date agreed upon, and so the necessity for saving time may influence the amount of machinery necessary even if the balance of factors does not prove the economy of the layout. Even if there is no completion date called for, each day is worth a certain number of dollars to the contractor due to overhead expenses, interest on investment, etc., and this value of time becomes one of the factors determin-

The Erection of the U. S. Appraisers Stores in New York City, Showing Well-Planned Layout and Mechanical Equipment Employed

ing the amount of plant that should be used.

EACH JOB A SEPARATE PROBLEM

In order to determine the suitable equipment for a job and its proper management, it is necessary for each piece of work to be analyzed separately, although, of course, a number of jobs may be so similar in size and character that the machinery found suitable for one may be equally suitable for the other. This condition usually prevails among the smaller or medium-sized job. The larger pieces of work, or those of special characteristics, always need careful study and it is seldom safe to accept what has been found satisfactory on one job of somewhat similar size or description. When a contractor has a piece of work to be done that is larger or more complicated than he has been accustomed to, he is often forced by lack of experience to seek outside advice as to what plant equipment he may need. This condition may result in the installation of machinery far beyond the point of economy. It may be that he has sought the advice of an agent of a company who is naturally biased in his ideas or he may have consulted with a plant engineer not in his own employ whose enthusiasm for the use of machinery is apt to lead to excessive expenditures. An analysis of the plant equipment on various kinds of jobs usually shows excessive equipment on large jobs and under equipment on medium-sized or small jobs.

MANAGEMENT BY A PLANT COMMITTEE

Construction equipment has become a matter of such great importance to the success of an up-to-date construction company that it is now generally necessary to organize the company so that there will be a separate department devoted to the management of this part of the company's business. Such a department selects and standardizes the construction machinery, has control of the company's equipment yards and shops where machinery is stored, repaired or manufactured. In some of the larger companies, such a department extends its service to make the decision as to what plant shall go to each job and how it shall be arranged. It would seem a better plan, however, for the construction department to take the initiative in the matter of plant and its arrangement for each piece of work because it is their responsibility if it fails to function properly. The advice of the plant department should however, always be at their disposal.

With the rapid development existing in the equipment market, it is a wise procedure for a large company to have a special committee to periodically augment the work of the Plant Department. This committee would be composed of men best qualified by their breadth of experience to widen the scope of the work being done as daily routine by the Plant Department The Turner Construction Company, realizing the need of bringing its plant equipment, yard and shops absolutely up to date, appointed such a committee to make a thorough investigation of the subject and report back to the company with definite recommendations for the improvement of this important part of the company's business. This group of men was known as the Plant Committee. After a careful investigation of existing conditions, the committee reported to the company and made definite recommendations which were approved and the committee was empowered to put them into operation. Besides being instructed to put its recommendations into force this committee was continued by the company to do certain research work and keep the Plant Department advised of improvements and new types of machinery so that the plant sent to jobs might always be efficient and up to date and best suited to the work to be done by it.

SELECTION OF PLANT

The first work of the committee was to determine what existing equipment was not suitable for use and what were the best types and makes of machinery with which to replace it. An investigation of the plant yards and shops showed, as is invariably the case with a growing company, that much of the machinery occupying valuable space was not up to date. With the rapid strides that are being made in the development of new machinery, it is very easy for a contractor's plant yard to become congested with machinery that may be in good working order and yet should have no place on

Respect for Construction Machinery

A fine piece of machinery is an object worthy of great respect, but, unfortunately, this is seldom felt except perhaps by the immediate operator who, no matter how "hard-boiled" he may be soon realizes that the slightest effort of his hand or foot is so magnified by the power of the machine he controls that he is able to do the work of a thousand men. He not only respects his machine, but has real affection for it and is known to brag about its ability to his fellow workmen.

Not long ago the Turner Construction Co. had to do some ticklish work in connection with the building of the West Palm Beach water works in which the scheme of sub-surface drainage that made the work possible was entirely dependent upon one pump. A pump has little romance attached to its life, but this machine was to shoulder a great responsibility over a period of three months and upon its uninterrupted operation depended the safety of the work. The owners volunteered the services of one of their specially designed 12-inch centrifugals for this duty. It was carefully set up, watched over and cared for night and day as a very important personage might have been. It did its work manfully and removed over 250,000,000 gallons of water without foundering. Mr. Wilson states "to those of us who realize what its non-stop flight of three months has meant to the job, the pump had assumed a real personality. It has now returned to private life and the humble duty of being an unimportant unit in a big plant that pumps water to a city, but when we pass the pump we feel like tipping our hats."

construction work in these days of high-priced labor. The committee decided to dispose of all such items as soon as they could be replaced by the most up to date and efficient kinds of machinery.

The next work of the committee was to make specific recommendations as to types and makes of machines for replacements and for additions to stock to take care of the increasing needs of the company.

When the committee came to this phase of their work, they found many factors that influenced their final decision. Of course, the first requisite of any piece of machinery is that it do its work in the field effectively and with economy. With the necessity of using high priced mechanics in assembling and setting up machines, there is considerable advantage attached to the machine that has a minimum amount of assemblage in the field such as the case of the portable crane as compared to the stiff leg derrick. The initial cost of the machine must be given consideration, but is not as important an item as the cost of maintenance and the shop costs in labor and repair parts in keeping the machine in good repair. The location in which the machine is manufactured also has a slight influence in the selection due to convenience in getting parts or factory service, if necessary.

STANDARDIZATION

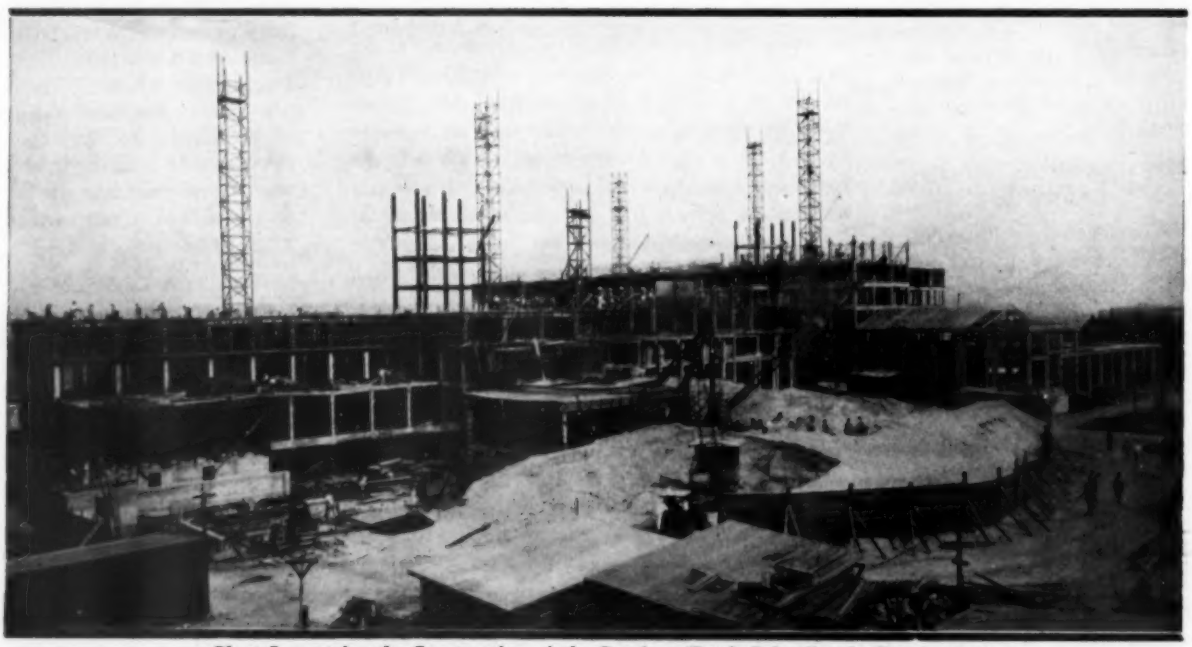
There is another item that was important enough to have considerable influence on the committee in making their selections and that was Standardization, the value of which cannot be emphasized too strongly. It is essential to the economical handling of the shop. As far as possible all hoists, for instances, were to be of one make, and of as few different sizes as possible. The shop mechanics become accustomed to one make of machine can understand its design and the shop is able to stock spare parts, whereas if eight or ten different makes of hoists were used, the above conditions could not exist.

Standardization is also an advantage to the operators in the field as they do not have to get acquainted with different makes of machines as they go from one job to another. Standardization, of course, may eliminate certain good items of plant, but these isolated cases will be less of a loss to the company than asking the shop to take care of an endless array of strangers.

In a company, like the Turner Construction Co., that has offices in different parts of the country, it is natural that the General Managers of these districts or their General Superintendents would have definite ideas about plant equipment that would differ one from the other. This condition would tend to interfere with standardization and, inasmuch as the company maintains one central yard and shop, it was decided to standardize even if certain types of equipment preferred by outlying districts had to be omitted from the company stock. This decision does not prevent any district having special equipment that they may desire, but it is purchased at their expense and is not returnable to the main yard. In other words, jobs are not able to procure special equipment on the low rental rates that standardized equipment is sent them. The lists of standard equipment, however, are revised from time to time to include items for which there is a reasonably continuous demand.

KEEPING UP TO DATE WITH EQUIPMENT

Upon the committee also lies the responsibility of keeping the Plant Department as well as the Construction Department conversant with all new developments in plant and labor-saving devices that may possibly lead to economies in the field. These newly developed ideas are investigated and tried out and those having merit are adopted for the company's use. When the committee assumed this duty it hardly realized the amount of work involved because at the present time there seems to be a wave of enthusiasm on the part of inventors and manufacturers of equipment and there is hardly a day goes by but that some new type of ma-



Plant Layout for the Construction of the Breakers Hotel, Palm Beach, Fla., in 1926

Adequate Equipment Well Serviced Played an Important Part in the Speedy Erection of the Home Office of the Massachusetts Mutual Life Insurance Company

chine or labor saving device is brought to the committee's attention. In connection with this phase of the work, it is also the duty of the committee to make a survey of the plant yard and shops twice a year and discard such items of plant as have outlived their usefulness. The committee is also brought into consultation with the Shop Superintendent in an effort to constantly reduce shop costs so that plant may be sent to jobs at a lower rental and thus aid the company in its competition for new work. The yard and shops are run without profit so that any economies that are practiced in the maintenance of plant accrue to the benefit of the individual jobs of the company which in this way are able to procure fine equipment at very low rentals.

Building the Andrus-Loew Theatre in Yonkers, N. Y., Which Called for Speed, Which Meant Proper Equipment in First-Rate Condition

COOPERATION BETWEEN YARD AND FIELD

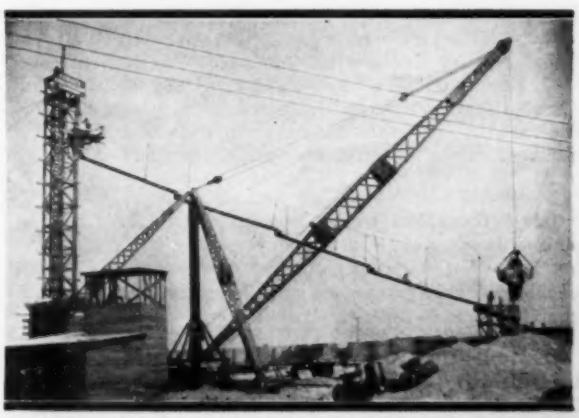
Cooperation between the men using the equipment and the men in charge of the yards and shops is essential to the welfare of this important part of a company's business. The Plant Department of any company is really a service department organized to assist the construction division in the accomplishment of its work. For such a service department to be of greatest value to those actually in charge of the operations in the field, it is necessary that there be a mutual understanding of each other's problems. For successful operation there should be a definite schedule of rentals that the individual jobs are charged, for the equipment sent them and, if the Plant Department is operated efficiently, these rentals will always be less than corresponding rentals from an equipment company because such a company is in the business naturally for the profit it can make from its transactions with those to whom it rents its equipment. The care that is given to machinery once it reaches the job has a direct influence on the repair bill of the machinery when it is sent back to the shop for reconditioning. The savings thus made by the lower shop costs accrue to the benefit of the Construction Department because it makes possible a lower schedule of rentals for the plant which it uses.

Two of the Plant Committee members have grown up in the Turner Construction Co. through years of service in the Construction Department and fully realize the need of having the Construction Superintendent learn more about and take greater interest in the equipment upon which they are so dependent for the accomplishment of their work. These two members of the committee still well remember their attitude toward the Plant Department or "shop" as it was then called, when they were Superintendents of Construction. They saw only their own problems on the job and had little interest in those of the men who kept them supplied with machinery and attempted under discouraging conditions to keep the machinery in operating condition until the job was over. In case of a breakdown of plant it was generally assumed to have been the fault of the shop. Either the machinery was not suitable for the work or it was sent to the job in poor condition. This attitude did not build up a spirit of cooperation between the shop and the job, but was probably beneficial to the shop in forcing it to become always on the alert to improve its service.

Unless the Superintendent of Construction has a natural mechanical bent and a liking for machinery, he is apt to look upon what he has to use as a necessary evil and as a result the machinery on which the welfare of the work depends has little care and generally gives trouble before the job is complete. It is the hope of the committee that these men can be stirred to a new interest in plant equipment because such an interest would be a benefit to the men themselves as well as their jobs.

The paragraphs set in italics on page 169 exemplify an ideal of respect for machinery that should become a part of the make-up of every member of a construction organization. Highly developed machinery makes possible the great structures of today.

ACKNOWLEDGMENT: Prepared from an article appearing in the *Turner Constructor*, published by the Turner Construction Co., New York.



Concreting Plant at the West Palm Beach Water Works, Fla.

Who's Who in Construction

A Series of Reports from Active Contractors Published Monthly

BUS. VOL.—ANNUAL VOLUME OF CONTRACTS
A—Over $5,000,000
B—Between $1,000,000 and $5,000,000
C—Between $500,000 and $1,000,000
D—Between $250,000 and $500,000
E—Under $250,000

P. T. Cox Contracting Co., Inc., New York, 154 Nassau Street. Organized September, 1916. Bus. vol. A. Officers: P. T. Cox, President Treasurer and Secretary; W. T. Fitzpatrick, Vice-President; H. C. Grefe, Assistant Secretary. Major contracts: construction of Bascule Bridge with approaches at Greenpoint Avenue over Newtown Creek, New York; reconstruction of High Bridge over the Harlem River, New York; construction of Steel Viaduct and Approaches in Riverside Drive West from West 155th Street to West 161st Street, New York; construction of Matanzas River Bridge, St. Augustine, Fla.; construction of Filtration Plant and Reservoirs for the City of Springfield, Mass. at Westfield, Mass; construction of substructure for North End Bridge, Springfield, Mass.; foundations for Victory Memorial Building, Washington, D. C.; foundations for New York Edison Power Plant, New York. Member: General Contractors Association and A. G. C. of A.

Photos by Blank & Stoller

P. T. Cox *W. T. Fitzpatrick* *H. C. Grefe*

The Holmes Construction Co., Wooster, Ohio., E. Liberty Street. Branch Office: corner Central Parkway & Ann Street, Cincinnati, Ohio. Organized 1914. Bus. vol. C. The company was reorganized and recapitalized in 1924, the original stockholders and directors still remaining with the company and acting as stockholders and officers. Officers: O. D. Miller, President; W. A. Miller, Secretary; Arthur Miller, Vice-president and General Manager; Joseph Cohan, Construction Manager. Major contracts: 1925, Canton, Ohio sewage disposal plant; 1926-27, Cincinnati Central Parkway Boulevard; 1925-6-7, 50 miles of Federal Aid and State Highways in Ohio and Kentucky. Member: Ohio Contractor's Association and A. G. C. of A.

Cain & Cain, Fort Worth, Tex., 409 Moore Building. Organized January 1924. Bus. vol. E. Officers: Everett Cain and Roy Cain, partners. Major contracts: fine churches, schools and business houses, remodeling business houses a specialty. Member: A. G. C. of A.

Angle-Blackford Co., Greensboro, N. C. Branch office: Asheville, N. C. Organized, July, 1925. Bus. vol. A. This is a consolidation of two firms with about thirty years experience, and is composed of C. J. Angle, C. W. Angle, G. T. Blackford, of Greensboro. Major contracts: Washington Duke Hotel, Durham, N. C., $1,600,000; Danville, Hotel, Danville, Va., $750,000; Buncombe County Court House, Asheville, N. C., $1,800,000; Greensboro Bank & Trust Co., Greensboro, $1,100,000; American Exchange National Bank, Greensboro, $850,000; City Hall, Greensboro, $650,000. Member: Local Builders Exchange, North Carolina and national branch of the A. G. C. of A.

F. A. Mote, Dallas, Tex., 515 Construction Industries Building. Organized 1920. Bus. vol. D. This company specializes in railroad and public building construction. Major contracts: two State Normal Buildings at Nacogdoches, Tex.; mess hall for the A. & M. State College; high schools at Colorado and Winters, Tex. Member: A. G. C. of A.

A. H. Meuche, DeLand, Fla. Organized 1926. Bus. vol E. This was originally a partnership formed with Chas Tiseo as the Royal Oak Cement Construction Co., in 1925, to operate in Florida in the Winter and in Michigan in Summer. The partnership was dissolved in 1926, when the Florida business was carried on by Mr. Meuche. Major contracts: sidewalks and curbing of the Stetson Estates, DeLand, Fla.; concrete paving for the city of Pierson, Fla.; bridges and culverts for Alachua County, Fla.

A. R. Coffeen, Decorah, Iowa. Organized January, 1914. Bus. vol. E. Officers: A. R. Coffeen, Manager. Major contracts: 1924, Y. M. C. A., Washington, Iowa, $90,000, and Mitchell Power Development, Mitchell, Iowa, $250,000; 1925, Greene Power Development, Greene, Iowa, $50,000; 1926, Luther College Gymnasium, Decorah, Iowa, $140,000. Member: Iowa Engineering Society, and Central Branch of the A. G. C. of A.

Grier-Lowrance Construction Co., Inc., Statesville, N. Carol. Bus. vol. C. Officers: Fred Lowrence, President; Henry P. Grier, Jr., Secretary and Treasurer. Member: North Carolina Branch of A. G. C. of A.

Watson Co., Dallas, Texas, 1927 S. Akard Street. Organized April, 1914. Bus. vol. B. This business was started in 1889 by Alex. Watson and incorporated as the Alex Watson Construction Co. Officers: Geo. S. Watson, President; John L. Babcock, Vice-president, T. M. Watson, Secretary. Major contracts: Santa Fe Terminal buildings, Southern Methodist University Stadium, and Neiman Marcus Building, of Dallas, and the Jefferson Amusement Theatre, Beaumont, Texas. Member: American Safety Council, Dallas Chamber of Commerce, Dallas Open Shop Association, and A. G. C. of A.

T. J. Prendergast Co., Chicago, Ill., 192 N. Clark Street. Incorporated May 29, 1926. Bus. vol. D. T. J. Prendergast started in business in Chicago in 1886, and has operated in Chicago, the northwest and west. Officers; T. J. Prendergast, President; W. A. Prendergast, Secretary; J. F. Prendergast, Treasurer. Major contracts: 1925, sewer system in Oak Park; 1926, water mains in Grant Park; 1927-8, sewer systems in Outer Drive and Grant Park.

LABOUR

Centrifugal

Self-priming

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LA BOUR Self-Priming pumps are wonder-workers, not only in regular practice, but they do bat the ball when "pinch-hitting" is a vital necessity.

We remember a tense situation in Pittsburgh, Pa., some time ago, when there was the very "dickens" to pay. A part of the down town section is heated by steam from central heating plants and these steam pipes run through conduit and tunnels in the streets. During high water these tunnels were flooded and water surrounded the hot steam pipes, which resulted in the formation of steam in the tunnels, the blowing off of manhole covers and so much steam was liberated into the streets as to make traffic dangerous.

Various pumps were put on the job to pump out these tunnels but, on account of the hot water and the suction lift, ordinary pumps would not function. LA BOUR Self-Priming Pumps were finally used with tremendous success.

Pumps AIR, Too

As we have described in previous ads, the LA BOUR regularly pumps air to a vacuum; pumps raw sewage, pumps water (and air) through well points—and *we guarantee a 20 ft. suction lift* at or near sea level datum.

Built in various sizes for stationary or portable service. Carried in stock by supply houses all over the country, or can be shipped immediately from factory.

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THE LaBOUR COMPANY, Chicago Heights, Illinois

H. A. Peters, Jacksonville, Fla., 147 East 6th Street. Organized 1895. Bus. vol. E. Officers: H. A. Peters, owner. Major contracts: complete plants for railroad shops, high school buildings, hotels, high class residences, etc.

Standard Construction Co., Houston, Tex., 523 Esperson Building. Organized May 22, 1923. Bus. vol. C. Officers: E. A. Fretz, President and Manager; C. W. Gartner, Vice-president and Treasurer; Mrs. E. A. Fretz, Secretary. Major contracts: 1924, Ricou-Brewster Building, Shreveport, La., $540,000, and Houston Textile Mills, Houston, Tex., $235,000; 1925, Reagan Senior High School, $308,000; 1926, Jefferson Davis Senior High School, $266,000, and 15 million gallon water reservoir, $180,000; 1927, Adams Street Bridge, $260,000. Member: Houston Chamber of Commerce, and A. G. C. of A.

Brown-Harry Co., Inc., Gastonia, N. C., 237 East Main Street. Branch office: Concord, N. C. Organized March 1, 1921. Bus. vol. B. This company was incorporated in 1926. Officers: L. A. Brown, President; E. R. Morgan, Secretary and Treasurer. Major contracts: Magnet Knitting Mills, Clinton, Tenn.; Halifax Cotton Mills, South Boston, N. C.; Cannon Manufacturing Co., Kannapolis, N. C.; Art Cloth Mills, Lowell, N. C.; First Baptist Church, Gastonia, N. C. Member: A. G. C. of A.

The W. J. Linn Construction Co., Portsmouth, Ohio, 340 Third Street. Organized March 1, 1926. Bus. vol. C. This company was formerly Taylor and Linn of Portsmouth and Ironton, Ohio. Officers: W. J. Linn, President; Major contracts: 1924, Court House, Portsmouth; 1925, St. Joseph High School, Ironton, Laroy Theatre, Portsmouth, and Goldcamp Furniture Store, Ironton; 1926, Bexley Junior and Elementary School, Bexley, Ohio, and other jobs ranging from $50,000 to $100,000. Member: Portsmouth Chapter of A. G. C. of A.

Petersen & Weeks Co., Waukegan, Ill., 1117 Washington Street. Organized 1916. Bus. vol. E. Peter W. Petersen started the business in 1905 and took A. S. Weeks into partnership in 1916. Major contracts: 1924, Waukegan Y. M. C. A., $205,000; 1925, National Office Supply Building, $40,000, and St. Joseph's School, $65,000; 1926, Holy Family School, $65,000, and Warren Twp. High School, $92,000; 1927, High School Addition, $60,000, Nash Garage, $50,000, Genesee Theatre, $170,000; 1928, Victory Memorial Hospital, Nurses Home, $96,000. Member: The Associated Builders of Lake County, Ill., and the Associated Building Contractors of Illinois.

Smith & Williams Co., Inc., Atlanta, Ga., 218 Red Rock Building. Organized June, 1925. Bus. vol. E. Officers: A. Q. Smith, President; Lee Hagan, Vice-president; J. F. Williams, Secretary and Treasurer. Major contracts: Addition to Norris Candy Co., in 1925; Dormitory for Eldridge Academy; addition to Shelbyville Cotton Mills, Shelbyville, Tenn.; studio for General Outdoor Advertising Co., Atlanta, Ga.; addition to Gainesville Cotton Mills, Gainesville, Ga.; store building for Pacolet Manufacturing Co.; New Holland, Ga., garage for Forsyth Street Garage Corp., Atlanta, Ga. Member: Atlanta Builders Exchange, and Georgia Chapter of A. G. C. of A.

The W. H. Shons Co., Freeport, Ill., 11 S. Liberty Avenue. Branch offices: Memphis, Tenn., Harrisburg, Ill., Chattanooga, Tenn. Organized 1922. Bus. vol. C. This is a co-partnership of W. H. Shons, M. K. Shons and F. C. Shons, formed to continue the business established in 1896 by W. H. Shons contracting largely in bridges and operating out of Freeport. Major contracts: 1925, Concrete and steel bridge 1800 feet long over the Kaskaskia River at Evansville, Ill.; 1927, bridge over Obio River in Tennessee (91 spans), bridge over the Wolf River in Tennessee (31 spans); 1928, Huling Tunnel, Memphis, Tenn.

The Kelly-Atkinson Construction Co., Chicago, Ill., 37 W. Van Buren Street. Branch office: Quincy, Ill. Organized 1896. Bus. vol. B. Prior to 1896 this was a co-partnership of Wm. F. Kelly and Chas. Atkinson. Since then it has been a corporation without changes except in stock holdings and officers from time to time. Officers: Wm. J. Howard, President; Lee Howard, Vice-president; Chas. Erbach, Secretary; M. Morris, Treasurer. Major contracts: 1926, viaducts and other work at the Chicago Union Station, Chicago, Ill., $1,000,000; 1927, viaducts, bridges, buildings, retaining walls for the South Park Commissioners, Chicago, $900,000; 1928, financing and building bridge over the Mississippi River for the Quincy Memorial Bridge Co., $1,250,000. Member: Chicago Chamber of Commerce, Steel Erectors Society of Chicago, and A. G. C. of A.

Standish Engineering Corp., Chicago, Ill., 400 N. Michigan Avenue. Branch offices: Ashtabula, Ohio, Rockford and Aurora, Ill. Organized March, 1922. Bus. vol. C. There has practically been no change in personnel of the officers of this company since organization. Officers: S. Standish, President and Treausrer; C. A. Duyser, Vice-President; A. R. Exton-Porter, Secretary; A. Cross, General Superintendent. Major contracts: work for the cities of Aurora, and Rockford, and for the states of Illinois and Ohio, and for toll bridge companies in Michigan, Canada and Florida.

Dilks Construction Co., Chicago, Ill., 160 No. La Salle Street. Organized February 1, 1927. Bus. vol. A. This company was originally Starrett Bros., Inc., organized in 1923, changed to Starrett-Dilks Co., in 1925. Officers: Lorenzo C. Dilks, President; Elwood G. Glass, Vice-president; James W. Rittenhouse, Vice-president; James G. Rigney, Secretary and Treasurer; James R. Preston, Assistant Secretary. Major contracts: 1924, Burnham Building; 1925, Crane Co. buildings and Book-Cadillac Hotel, Detroit; 1926, Book Tower, Detroit, and Pure Oil Building; 1927, 100 W. Monroe Building, Bankers Building, 65 E. So. Water Street Building; 1928, Willoughby Tower. Member: Building Construction Employers Association, Builders Association of Chicago, and A. G. C. of A.

Sterling Bridge Construction Co., Joliet, Ill., 1004 Fourth Avenue. Organized March, 1924. Bus. vol. E. This company was located at Sterling, Ill., moving to Joliet in 1926. Officers: D. S. Kotorchevich, President; Walter S. Todd, Secretary-Treasurer. Major contracts: highway bridges in Henry, Will, Du Page and Livingston Counties.

Roberts and Schaefer Co., Chicago, Ill., 400 N. Michigan Boulevard. Branch offices: 418 Oliver Building, Pittsburgh, Pa., and 514 West 9th Avenue, Huntington, W. Va. Organized September, 1904. Bus. vol. B. This company has operated continuously under the original organization. Officers: W. R. Roberts, Chairman of the Board; Edward E. Barrett, President; J. J. Roberts, Treasurer; F. E. Mueller, Vice-president; C. P. Ross, Vice-president. Major contracts: 1925, Berwind-White Coal Mining Co., four contracts for the Atlantic Coast Line R. R., West Canadian Collieries, Algoma Coal & Coke Co., and Wabash R. R. & Southern R. R.; 1926, six contracts for the N. Y. N. H. & H. R. R., four contracts for the Atlantic Coast Line R. R., Brazeau Collieries, Canada, Pittsburgh Coal Co., and Elk River Coal & Lumber Co.; 1927, Republic Iron & Steel Co., three contracts for the Pittsburgh Coal Co., Central R. R. Co. of N. J., Lehigh Valley R. R. Co., and Hillman Coal & Coke Co. Member: Chicago Association of Commerce.

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RANSOME AMERICA'S FIRST MIXER

Legal Points for Contractors

These brief abstracts of court decisions in the contracting field may aid you in avoiding legal difficulties. Local ordinances or state laws may alter the conditions in your community. If in doubt consult your own attorney

Edited by A. L. H. Street, Attorney-at-Law

Language of Bond, Not Statute, Governs the Surety's Liability

Where a highway contractor gives a bond in connection with the performance of a contract, the language of the bond fixes the surety's liability, and not the statute under which the bond may have been given. If the bond be broader than is required by the law, in the matter of the obligations of the contractor secured, the surety is nevertheless bound. And if the bond be so worded as to be more restricted than it should have been, the surety's obligation is limited to such restriction. In reaching this conclusion in the case of American Surety Co. of New York vs. James A. Dick Co., 23 Fed. (2d Series) 464, decided December 24, 1927, the United States Circuit Court of Appeals, Eighth Circuit, cited a similar decision of the United States Supreme Court.

The court, also, ruled that such a bond given to the State of New Mexico, to secure the state against loss through the contractor's default, negligence or omission, rendered the surety liable to individuals having claims against the contractor for labor or materials furnished under the contract. This bond was held to cover claims for feed for horses employed in the work, provisions and board furnished men in a camp maintained on the job, and for materials furnished to build camps and storerooms.

Abutter's Right to Surplus Dirt

Defendants had a contract for grading a street in Silverton, Oregon. The property through which the street ran was owned by plaintiff. Plaintiff seasonably notified defendants that he claimed all the surplus dirt excavated opposite his property, and designated a place where it could be dumped on his property, the most convenient place for that purpose. Defendants refused to do this, and contracted with a third party that, if he would haul it away after defendants had loaded it, he could have it without charge.

Upholding plaintiff's right to recover the value of the dirt of which he was thus deprived the Oregon Supreme Court said, in a decision handed down February 14, 1928, in the case of Adams vs. Harmon, 264 Pac. 356:

"There was a convenient place where the defendants could have dumped the surplus dirt on plaintiff's property. Defendants saved themselves the expense of dumping it there by using plaintiff's dirt to pay Webb for hauling it away to a distant locality. They had no right to do this, and the case comes clearly within the rule laid down by us in Sharkey Co. vs. City of Portland, 58 Or. 353, 106 P. 331, 114 P. 933."

General Contractor, Although Present, Was Not Liable for His Subcontractor's Negligent Blasting

Defendant had a contract to excavate for and pave a highway in Wisconsin. He sublet the excavation work to one Braman who, in removing a large rock from the road so negligently blasted it as to damage plaintiff's nearby property. A trial court decided that defendant must stand good for the loss, so far as plaintiff was concerned, but the Wisconsin Supreme Court reversed the ruling, in a decision handed down October 11, 1927 (Kolb vs. Hayes, 215 N. W. 578), saying:

"That the subcontractor Braman was . . . an independent contractor is not open to substantial dispute. . .

"Braman being an independent contractor, the defendant had no more right of control over the method by which the work should be done or right to supervise the details of doing the work than a third person. His mere presence as a spectator at the scene of the accident cannot make him liable for the negligent . . . acts of his independent subcontractor. . .

"That a proprietor or principal contractor cannot entirely relieve himself from liability for the acts of a sub-contractor must be conceded. There are certain duties which the proprietor or principal contractor cannot delegate, and if he attempts to delegate them and in the performance of the work third persons sustain injuries, the proprietor or principal contractor remains liable. . . . Among these are duties imposed by statutes, municipal ordinances, or by-laws and other departmental regulations having the force and effect of law, the duty to refrain from creation or maintenance of a nuisance, and other matters of like character.

"It cannot be argued that a contract to do ordinary earth excavating under a contract for subgrading presents a situation where, by the act to be done under the contract, a nuisance or defect will naturally or necessarily be created. Such a case would arise if the excavating disturbed an adjoining proprietor's right to lateral support or required him to do some other act which fell within the class of cases already referred to as inherently dangerous."

Contractor's Right to Additional Compensation Considered

Rights of a contractor to additional pay for work in constructing a section of the New York Barge Canal were passed upon by the New York Court of Appeals in the case of American Pipe & Construction Co. vs. State, 159 N. E. 892, decided January 10, 1928. The following is the substance of the conclusions reached by the court:

Since this contract required the contractor to excavate material "of every name and nature necessary for the purpose of forming the canal prism," there was no right to extra pay for removing timbers, sheet piling, and a lock from the site of an old canal incorporated within the boundaries of the canal under construction.

But there was a right, under the terms of the contract, to extra compensation for building a bulkhead supporting an embankment between the canal and a parallel ditch.

The contractor is not entitled to additional compensation for procuring material for a "spoil bank" although the excavated material which the contract provided should be used for the purpose proved to be insufficient between certain stations.

A clause providing for but single payment for excavations, and that the contract price should cover rehandling material, precluded the contractor from claiming additional pay for re-excavating material in constructing bridge approaches.

Responsibility for Injury to Borrowed Employee

Martin, a subcontractor, undertook to level ground, haul cinders, etc., for a mile over a highway. Martinelli hired a truck and driver to Martin for doing this work at the rate of $2.50 per hour. While the work was being carried on, the driver was struck by a railway train and killed. Question then arose as to who was his employer, for the purpose of workmen's compensation liability.

The Pennsylvania Supreme Court ruled that, although the driver was the general employee of the owner of the truck, he was for the time being the servant of the subcontractor, and accordingly an award under the Pennsylvania Workmen's Compensation Act was affirmed. (Robson vs. Martin, 140 Atl. 339, decided January 3, 1928.) The decision turned upon the point that the owner of the truck did not take the contract to remove the ashes, in which case he would have remained exclusively the employer; he merely furnished the truck and driver, who for the time being became subject to control by the subcontractor.

Street Grading Contract Contemplated Removal of Forced Slides

The validity of tax bills issued to a street grading contractor in Kansas City was in controversy between assessed property owners and holder of the tax bills, in the case of Seested vs. Dickey, 300 S. W. 1088, decided by the Missouri Supreme Court September 27, 1927. Upholding the bills, the court said:

"There is evidence that earth and rocks fell into the cut, while work was in progress. That, under the express terms of the contract, could not be called extra work, for the contract provides that such slides shall be removed for the same compensation as the other excavation. The evidence, however, shows that work was not included in what was termed the removal of forced slides. As explained by the contractor, the forced slides were of such material as on inspection was found to be dangerous and in the future likely to slide into the cut; thereby rendering the street dangerous. They were called 'forced slide,' because instead of waiting for them to fall, they were taken down. The concontractor explained the unusual difficulty of taking down the banks, as required of him by the engineer. It is clear that this extra work was contemplated by the parties to the contract, and properly chargeable as part of the improvements.

Validity of Awards of Public Work on Competitive Bidding

An instructive exposition of some of the most important rules of law on this subject appears in the decision handed down January 19, 1928, by the Alabama Supreme Court in the case of Van Antwerp vs. Board of Commissioners of the City of Mobile, 115 So. 239. There taxpayers unsuccessfully sued to enjoin execution of a contract for the construction of two incinerators. The following is a summary of some of the conclusions reached by the court:

Even where the statutes permit a city to award a contract without competitive bidding, the decision of the authorities to invite proposals requires an award to the lowest responsible bidder complying with the terms on which tenders are invited.

"One of the essentials to competitive bidding is that bidders shall have opportunity to bid on the same thing. In case of public improvements or plants, the adoption of plans and specifications made available to all as a basis for their bids is a legal requirement. When bids are called for from manufacturers of different types of plants based on their own specifications, the necessity arises to determine whether any of them meet the specific needs of the city, and, if so, which is the better bid all things considered. This cannot be termed competitive bidding within the meaning of mandatory statutes requiring the awarding of contracts to the lowest bidder, and usually contracts so let are regarded as in violation of such statutes."

"Where, as here, there is no mandatory statute requiring contracts to be awarded on competitive bids, it is within the power of the city authorities to invite bids on such basis as it may deem just, reserving the power to reject all bids, or let the contract to the bidder submitting the most desirable proposal."

Remember That the Public Engineer is Not All Powerful

A contract for a county highway in Kentucky provided for a road 18 feet wide. The county engineer ordered the contractor to build the highway 24 feet wide, which was done. When the county refused to allow for this extra construction, the contractor relied, but unsuccessfully, upon a clause in the contract, to the effect that "extra work ordered by the county road engineer" should be paid for on certain cost plus basis. And the contractor also unsuccessfully contended the county was estopped to deny liability for extra compensation, because no objection was made as the work progressed.

Disposing of the controversy, the Kentucky Court of Appeals said (Pike County vs. Waugh, 1 S. W. (2d Series) 1066):

"Doubtless, the fiscal court had the funds on hand with which to pay for an 18-foot roadway. It may or may not have had funds with which to pay for a 24-foot roadway. Even if it had such funds, in its discretion it may have determined to use such funds elsewhere. It had to exercise a discretion in fixing the width of the road. Clearly, it could not surrender its discretion to any one else. If the road engineer could change the road from 18 to 24 feet in width, he could change it in any particular he desired. Indeed, if he could change the width, there is no reason why he could not change the length, because a determination of one is as much a matter of discretion as is the other. If he could change the contract so as to increase the cost of the road or have made any other change he desired. Clearly, such authority is not given and could not be given to the road engineer, and his acts in so doing were ultra vires (beyond his power) and void. . . The provision for its payment of extra work on the cost plus basis is not inconsistent with this conclusion, as it was evidently intended to cover incidental matters arising in the progress of the work and not covered by the elemental units entering into the work on each of which a price was fixed in the contract. Certainly, it was not intended to authorize a change of the contract by the engineer.

"It is said, however, that as the county made no objection to the progress of the road work and is receiving the benefit of the road it is estopped to deny lack of authority upon the part of the county road engineer. The rule is applicable to individuals, but does not apply to municipalities. It is also well settled that persons dealing with municipalities must take notice of the limitation placed upon the agent's authority and deal with them at their peril. This rule works a great hardship upon appellee in this case and it is regrettable that he cannot recover the cost of this work, as it seems admitted that it was properly performed and that the provisions of the contract were carried out; but, regrettable as it is, any other rule might result generally in financial loss to municipalities and conflict with public policy. In the Owego Bridge Case, supra, the contractor was permitted to remove the bridges it had constructed, and in this instance, perhaps, the appellee would be permitted to remove the extra material he has placed upon the roadway, if this could be done without injury to the rest of the road; however, we doubt if this would be practical or possible."

n-833-L

Waukesha-Powered Thew Back-Digger at Highland Park, Illinois

A Gas Powered Paw

Like a huge, steel-sinewed paw, with mighty claws, irresistibly impelled by a Waukesha Heavy Duty gasoline engine, this Thew Back-Digger crowds its way. Twenty-four inches of frozen ground did not stop it on this winter job. Get Waukesha-equipt machines when you want gasoline power. They see you through unfailingly.

The versatility of this back-digger makes it important to use a powerful engine that uses little fuel, is sturdy to stand the punishment, and flexible enough to give the operator perfect control of the tilting bucket. For industrial purposes you will find a full range of Waukesha Engines with genuine "Ricardo" heads ranging from 20 to 125 H. P. Write for Industrial Bulletin No. 556.

N-868-L

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Construction Industry News

The Universal Portland Cement Co., 208 South La Salle St., Chicago, Ill., has announced the appointment of A. C. Cronkrite as Assistant General Sales Manager; Edward Quebbeman as Western Sales Manager; W. L. Greenly, Division Sales Manager for Chicago; Harry A. Craig, Division Sales Manager for Illinois and Missouri, and Earle D. McKat, Division Sales Manager at Duluth.

Charles M. Upham, Business Director of the American Road Builders' Association, Inc., National Press Building, Washington, D. C., has been in Mexico City assisting in the preparation for the Second National Road Congress, which will be held in that city during the week of October 3rd. The Hotel Regis has been selected as headquarters of the Congress and the meetings will be held in the Teatro Regis, adjacent to the hotel. The principal hotels in the city have offered special rates for delegates and tourists attending the Congress, and reduced railroad rates will be granted all who attend.

The Chas. T. Topping Machinery Co., manufacturer of excavating machinery, has announced the removal of its offices from the U. B. Building, Dayton, Ohio, to 4403 St. Clair Avenue, Cleveland, Ohio. The company has recently completed arrangements providing it with enlarged manufacturing facilities and plans the production of its products in larger volume.

The Chain Belt Co., Milwaukee, Wisc., has started work on a new manufacturing building on its 59-acre tract at 39th and Orchard Street, Milwaukee. This is the fourth unit to be erected and is a part of a general plan for extension. The main office is still on the 16th Street Viaduct.

The Austin-Western Road Machinery Co., 400 No. Michigan Avenue, Chicago, Ill., has announced that it has entered its three-score-and-tenth year of service. The first road building machine of that company was put in service in 1858, it being a wooden frame drag scraper. In 1877 the Western wheeled scraper was placed on the market, and the full 1928 line embraces every type of machinery for building and maintaining roads.

The Universal Crane Co., formerly located in the Swetland Building, Cleveland, Ohio, now has its general sales and advertising offices at East 28th and Fulton Streets, Lorain, Ohio.

The Concrete Mixing & Conveying Co. of Chicago, Ill., (Ransome Concrete Machinery Co., sole licensee) has announced the winning of a suit upholding the validity of the McMichael patent on pneumatic concrete placers. This latest decision has been sustained by the United States Circuit Court of Appeals for the Second Circuit. The case was versus the Powers-Kennedy Contracting Corp., and another, for infringement, and the McMichael patent was given a broad interpretation by the court.

The Asphalt Association, 441 Lexington Avenue, New York, has announced the appointment of J. M. Page as Southern Branch Manager with headquarters at 435 Whitney-Central Building, New Orleans, Louisiana. Mr. Page succeeds W. H. Rhodes who recently resigned to accept a position with the New Orleans Refining Co. The territory covered by the southern branch of the Asphalt Association embraces the states of Texas, Arkansas, Oklahoma, Louisiana, Mississippi and Tennessee. Mr. Page was formerly State Highway Engineer of Oklahoma and prior to that engineer in the U. S. Bureau of Public Roads.

The Smith Trailer Corp., 2611-2639 Lodi Street, Syracuse, N. Y., has announced that it has purchased the tracings, blueprints, patterns and templates for the Watson bottom dump tractor wagon formerly manufactured by the Rex-Watson Corp., of Canastota, N. Y. It will continue the sale and manufacture of heavy wagons to be known as the Smith trailers. Models R-3 and R-6 will be equipped with wheels and in addition there will be built Models C-7 and C-10 equipped with crawler wheels. The rated capacities of Models R-3 and R-6 are 3 and 6 yards, respectively, and of Models C-7 and C-10, 7 and 10 yards, respectively. Harold P. Bentley, Production Manager, formerly connected with the Watson Corp., will be in charge of production and R. Shaw Goldthwait also formerly with the Watson Corp., as sales manager, will direct the sales in the new corporation.

The Heil Co., Milwaukee, Wisc., has announced the appointment of Stiles-Murray, Inc., Des Moines, Iowa, as distributors of Heil dump bodies and tanks in the Iowa territory. R. E. Stiles, President, has been connected with the truck and tractor industry for a number of years and E. F. Murray, Vice-president, has also been in the truck game for a considerable period.

The Chicago Pneumatic Tool Co., 6 East 44th Street, New York, has recently completed a large new modern foundry at Franklin, Pa., where all gray iron castings for compressors and engines will be made. The buildings and equipment represent an investment of over $400,000. The company also has large plants at Detroit, Mich., and Cleveland, Ohio.

McEverlast, Inc., is the new name of the Everlasting Paint and Sales Co., sole distributors of McEverlast protective coatings and owners of the Hunt Process of curing concrete by the use of asphalt sprayed on the surface immediately after pouring. The offices of the company are at 1110 Board of Trade Building, Los Angeles, Calif., and the officers are: A. M. Shenk, President and General Manager; F. W. McRae, Vice-President; Geo. W. Anderson, Secretary and Treasurer.

The Chicago Automatic Conveyor Co. has announced a change of address from the Old Colony Building, Chicago, Ill., to 1839-49 South 55th Avenue, Cicero, Ill.

The Brown-Bevis Co. has announced its removal to a new location at Santa Fe at 49th Street, Los Angeles, Calif., where yards, shops, warehouses, salesroom and office have been consolidated in enlarged quarters.

The Robins Conveying Belt Co., 15 Park Row, New York, has announced that Richard H. Dana, formery Vice-President and Treasurer of Hodge & Dana, Inc., of New York, active in the vibrating screen field, is now connected with the Robins Co., and will specialize in the engineering and sale of screens.

The Robert W. Hunt Co., Engineers, 2200 Insurance Exchange, Chicago, Ill., has appointed C. E. Plummer to the position of Chief Chemical and Metallurgical Engineer, with headquarters in the general office. Mr. Plummer has been connected with the Bureau of Mines, Bureau of Standards and with the Union Carbide & Carbon Co., in charge of work in their research laboratories.

AMERICAN TELEPHONE AND TELEGRAPH COMPANY
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The Instructions as Received in Chicago by Telephotograph

Picture-By-Wire Service Speeds Steel Service

THE telephotograph service of the American Telephone and Telegraph Co., 195 Broadway, New York, was recently called into use by the Sinclair Pipe Line Co., of Tulsa, Okla., which was in urgent need of reinforcing material for building a large reservoir at La Rose, Ill. The order called for 1,890 reinforcing bars with 1,100 bends, 7,300 bar ties, and 14 rolls of wire mesh. It was given to W. T. Branson, Tulsa representative of Jos. T. Ryerson & Son, Inc., of Chicago, Ill., for personal and quickest possible action.

Reproduction of the Telephotograph of the Blue Print Orders for Reinforcing Material

As the order was in the form of a blueprint with sketches of the bends, etc., it could not be transmitted by telephone. It was late in the day, so Branson taxied to the Tulsa station, dispatching the order and sketch on the fast mail train to St. Louis. The order was received at the St. Louis plant in the morning. As La Rose could be served quicker from Chicago, the order was immediately telephotographed to the Ryerson Chicago plant. Through this wired photographic system absolute accuracy makes checking or confirmation unnecessary.

The Reinforcing Steel Department wrote up the order in the usual way and copies were in the shop at once. The bonus time chart showed 3.1 hours shearing time and 3.5 hours bending time, but crews doubled up and in 1 hour and 25 minutes the material was ready. In the meantime the Traffic Department had lined up a car, and in 30 minutes more the reinforcing for the Sinclair job was moving out of the plant.

The car number and routing were then wired to the Ryerson St. Louis plant for advising the customer. The carload was switched from the Pennsylvania to the Santa Fe Railroad, and left Chicago that night. The car reached La Rose, Ill., at 4:20 in the morning ready for use in the reservoir the next day.

A Lubricant for Heavy-Duty Equipment

A GOOD lubricant, regardless of the price per pound, is the cheapest lubricant you can use on your tractors, trucks, shovels and other construction equipment. D-A lubricant, made by the D-A Lubricant Co., Inc., Indianapolis, Ind., is used on transmissions, final drives, high pressure fittings and grease cups, track rollers, etc., of tractors, on transmissions and differentials, universal joints, wheel bearings, shackle bolts, etc., of trucks, and on dipper sticks, open and closed gears, transmissions, cables, track rollers, high pressure fittings, etc., of shovels.

This lubricant keeps equipment on the job, and it saves costly repairs and replacement parts. It gives a positive seal to track rollers from mud, water, snow, grit and dust. It will not gum up in transmissions and final drives. Time in lubricating equipment is saved, since D-A has a lasting durability for many months of hard work.

Speedy Steel Construction

A 10-story structure being used as an addition to Bullock's, Los Angeles, Calif., is now completed and represents a new record in speedy construction, according to the American Institute of Steel Construction. The old buildings on this site at the corner of Seventh and Hill Streets, Los Angeles, were demolished in April, 1928. The finished piers for the beams were in place the first of May and by the first of June all the steel framing was in place. Goods were actually bought at Bullock's on the third floor of the new building on July 8.

The structural steel in this building, amounting to 1172 tons, was erected in 15 working days, according to the Llewellyr. Iron Works of Los Angeles, who were responsible for the job.

Structural steel for West Coast developments is purchased from mills in the east. Despite this distance from the source of supply, the steel fabricator, due to the great improvement and standardization of the art which has been effected in the last few years, is able to schedule and erect this work with a greater dispatch than ever before.

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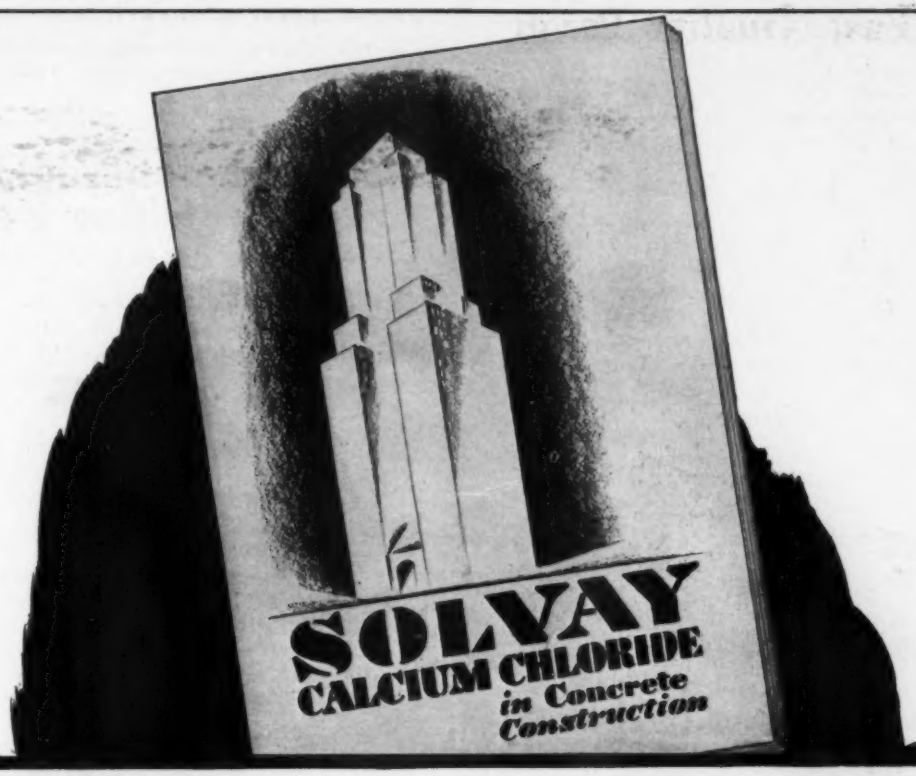

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The 13-E is built up to the high standards of the Ransome 27-E "Master" paver. It is fast in loading, mixing and discharging. It is sturdy in construction to insure steady, dependable operation. It is easy to handle, as the levers are within easy reach of the operator. The Ransome standard all steel mixing drum insures thorough, fast mixing, together with

The New Ransome 13E-Paver

locomotive tires for tracks, flanged car wheels for rollers with Timken bearings.

Full length crawler treads are used on the unit. A power loader, automatic water tank, batch meter, boom and bucket or distributing chute are features. The 4-cylinder 30-horsepower Buda gasoline engine has a 3¾ x 5⅛ stroke at 1200 r.p.m. The clutch and 4 to 1 gear reduction are attached to the flywheel housing. The Zenith carburetor and Eisemann magneto have an impulse coupling. There is a united air cleaner, and the radiator is cooled with fan and water circulating pump.

The stream line loader skip is 91 inches wide, made of No. 10 plate and strongly reinforced. It is swung on a double pivot which reduces the power required to raise. The upper winding drums of the loader hoist are grooved for the cable and tapered to increase the speed of the skip as it rises. The drum is of all steel welded construction.

The discharge chute is in two pieces, an upper swinging chute and a lower stationary chute with splash plate inside of the drum drip ring. The chute is operated by a hand wheel and self-locking mechanism. The boom bucket capacity is 19 cubic feet level, with a single drop door set crosswise of the bucket and arranged to spread the concrete in a uniform layer as the bucket is drawn in toward the mixer.

The water tank of 24 inches diameter by 32 inches high is set vertically. It has an inside adjustable displacement tank and will measure accurately any amount of water between 8 and 25 gallons. Adjustment is made by a handwheel with an indicator and scale, so that it can be set for the required amount of water, and when once set will deliver that amount each time regardless of the grade that the paver may be working in. The water valve is of the balanced piston type with cup leather packing and no seats to become scored and leak.

Alemite lubrication is used throughout the unit. A tool box and kit of tools are furnished. All operating levers are banked for convenient operation.

A Combination Tool Heater and Melting Kettle

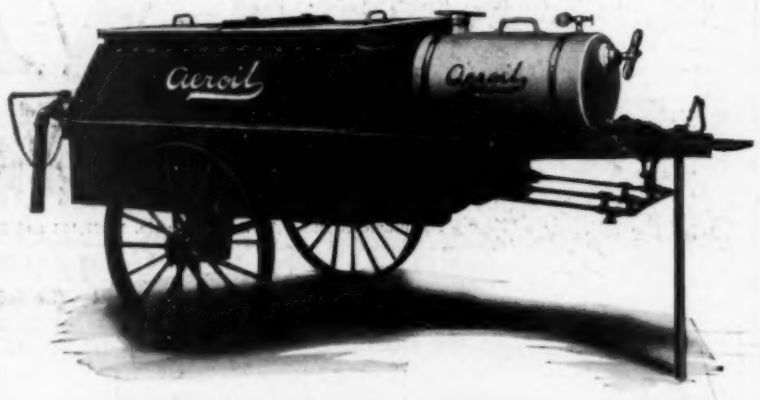
A COMBINATION tool heater and melting kettle, Type S, that combines in one unit an oil-burning tool heater with a capacity for fifteen paving tools, such as tampers, smoothers, shovels, rakes, etc., and an asphalt cement heating kettle of 50 gallons capacity, which will produce hot binder within ten minutes after starting the oil burners, has been developed by the Aeroil Burner Co., Inc., Park Avenue at 13th Street, West New York, N. J. Smoke, sparks, ashes and cinders are entirely eliminated with this heater, which makes it especially suitable for contractors and road builders working in congested sections of cities.

The tool heating compartment is insulated on the bottom with 1-inch thick asbestos to prevent heat loss, and is reinforced with angle iron to properly support the weight of the paving tools and prevent warping.

The unit is equipped with three heavy-duty No. 12K Aeroil torch type oil burners, each controlled by a separate valve, so that one, two or three burners can be operated at one time according to the amount of heat wanted. The kettle is equipped with a patented dividing screen, which separates the hot material from the cold material and prevents clogging of the "never-leak" draw-off cock. The double dipped galvanized fuel tank has a capacity of twenty gallons and is equipped with an easily operated hand pump. Special heat shields keep this fuel tank from becoming overheated under any operating conditions.

The chassis is constructed on 3-inch heavy channel iron, mounted on two 32-inch diameter steel wheels equipped with roller bearings and large grease cups. The pulling eye is made of forged wrought iron. A special non-collapsible drop leg, made of 1-¼-inch extra heavy pipe with locking pin, holds the heater in a horizontal position when not being trailed. The axle, cushioned with special spiral springs, is made of high carbon steel.

The combination tool heater and melting kettle may be had mounted on rubber tired wheels, and is also equipped with 9 leaf regulation truck springs. With this combination it is possible to quickly move the unit from one job to another behind a light-weight truck.



The Aeroil Type S Combination Tool Heater and Melting Kettle on Steel Wheels

Little Time—
Little Money—
and Lots to Do!

FOR that hurry-up, last-minute road job at the fag-end of the season and the short end of the appropriation, specify—

Tarvia "RE-TREAD"

This revolutionary method salvages and rejuvenates old highways speedily, economically. Costs are surprisingly low; results—uniformly satisfactory.

A post card or wire will bring the Tarvia field man to discuss the details with you.

Greenbrook Road, Somerset County, N. J. Tarvia "Re-Tread"

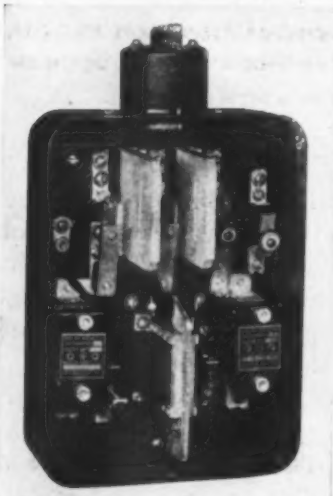
The Barrett Company

New York, St. Louis, Detroit, Youngstown, Chicago, Salt Lake City, Milwaukee, Minneapolis, Syracuse, Baltimore, Cleveland, Providence, Toledo, Philadelphia, Buffalo, Cincinnati, Birmingham, Bethlehem, Lebanon, Boston, Kansas City, Columbus, Rochester

In Canada:
THE BARRETT COMPANY, Limited: Montreal, Toronto, Winnipeg, Vancouver

Hand Control Switch for Any Starter

TWO small control switches have been developed by the General Electric Co., Schenectady, N. Y., for application where it is desirable to control a magnetic switch at the switch itself. These may be mounted in the knockouts of the enclosing case of any starter and are held rigidly in place by a conduit bushing which forms part of the switch.



A GE Magnetic Switch Installed in Top of an Enclosing Case

Type SY-103-A is a maintaining - contact switch, the action of which is similar to a single - pole, double-throw switch. It is provided with three positions, "Hand," "Off," and "Automatic." Its chief application is where float switches, pressure governors, etc., are used in the same manner as a thermostat in various applications. When the operating lever of this switch is in the "Automatic" position the thermostat, float switch or governor controls the machine. In the "Hand" position the machine runs continuously, and in the "Off" position the control circuit is opened.

Type SY-104-A is a 2-position, momentary-contact switch provided with the positions "Start" and "Stop." This is the equivalent of the usual push-button station of the same marking. It is most applicable where starting and stopping of the motor is necessary at the magnetic switch itself.

Both switches are equipped with leads ready to wire and have sufficient capacity to handle any magnetic starter up to 75 amperes capacity. The new switches can be used on 600-volt circuits with safety, as their insulation is designed for maximum safety to the operator.

Rock Crushing and Screening Plants

THE development of local rock and gravel deposits is one of the greatest single contributing factors to the economical construction and maintenance of roads today. With this fact in mind, the Austin-Western Road Machinery Co., 400 No. Michigan Ave., Chicago, Ill., recently brought out portable crushing and screening plants that are adaptable for service under all conditions because of the flexibility of the separate units.

Nearly every locality in the country has within its limits deposits of stone or gravel, or quantities of roadside stone, that are usable for road purposes. Knowing that local conditions vary so greatly, that few plants can be set up in exactly the same way, Austin-Western has designed elevators, screens, bins feeding conveyors and crushers that combine to make completely portable plants, whether purchased together or separately.

Austin portable gravel screening and crushing plants are built for use with type-100 Austin gyratory crushers. A typical plant consists of a 50-foot portable conveyor, 12-foot revolving screen, 15-yard 2-compartment portable steel bin and No. 104 Austin portable gyrator crusher, with folding elevator.

The Austin Gravel Screening and Crushing Plant with Portable Gyratory Crusher

The operation is as follows: the conveyor carries the gravel to the revolving screen which has 4 feet of ½-inch perforations to take out the sand, and 8 feet of 1-inch perforations. The oversized material passes out the end of the screen and down a chute to the crusher. After being crushed, it is returned to the screen again, and a grizzly spout diverts the stone chips to the second compartment of the bin instead of permitting them to drop through the first screen section into the sand.

The Western road metal plant is completely portable and recommended for reducing all sizes of gravel to a designated maximum such as 1-inch. Crusher, screen and return elevator are mounted on the same truck.

The Western Aurora jaw crusher is used with Western road metal plants. The 2-blow stroke delivered by this crusher increases production, eliminates vibration and saves power. The hourly capacity ranges from 5 to 25 tons, depending on the size of crusher used. The gravel is brought to the screen by a portable conveyor. Either the shaker type of screen, or a double rotary screen may be used.

The material smaller than the designated maximum—which in most localities is now 1-inch—drops through the screen and is transported directly to the bin. The oversized material passes out the end of the screen into the crusher, and after being crushed is brought back to the screen by the return elevator.

A Western Road Metal Plant with Western Aurora Jaw Crusher

If it is desired to remove the sand, a very efficient device for either type of screen can be supplied, which takes out the sand immediately, and diverts it to a separate delivery conveyor. Delivery of the finished product from plant to bin is made either by a bucket-type of elevator or a belt conveyor.

Modifications in Junior Beam Specifications

THE American Institute of Steel Construction, 285 Madison Avenue, New York, N. Y., has issued revised pages 298 and 299 of the A. I. S. C. Handbook. The data contained on these pages gives complete information regarding slight modifications in Jones & Laughlin Junior beams. The revised data should be used in all future calculations. Copies of these pages may be secured from the Institute.

Eleven Years of Service As Good as New

This 8-inch Universal Pipe water supply line at Leon Springs Training Camp, Remount, Texas, laid eleven years ago, continues to give dependable uninterrupted service.

Nothing to deteriorate, nothing to work loose in these tight, flexible, iron-to-iron joints. Wrenches the only tools.

Let our nearest office show you why Universal Pipe is so much easier—quicker—safer . . . .

UNIVERSAL CAST IRON PIPE

No bell holes to dig: No joints to calk

THE CENTRAL FOUNDRY COMPANY

Subsidiary of The Universal Pipe and Radiator Company

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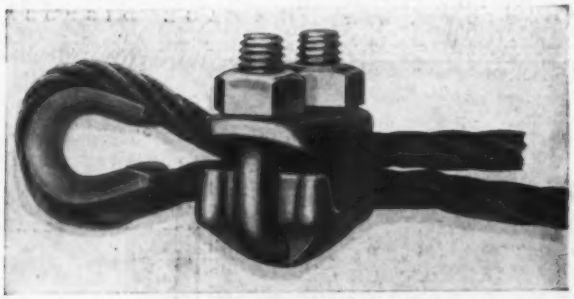


The New Eureka Cable Clip

A New Cable Clip with Grooved Jaws

A CABLE clip which the manufacturers claim has a considerably larger holding surface, has been announced by the Eureka Metal Products Corp., North East, Pa. This patented clip, according to tests, has shown its ability to carry three times the maximum load of an ordinary clip and gives equally good results on wire rope and messenger strand.

The construction of the clip is rugged and it has but four parts. The extra grooved jaw is peened to the U. This clip, according to the manufacturer, gives greatly increased safety because of its triple grip upon the cable. Another feature which is of almost equal importance is the fact that any size wrench can be used to tighten up the Eureka clip. There is no chance whatever of injury to the cable, regardless of the size wrench that is used, as the double grooved surface prevents distortion of the cable no matter how tight the nuts are pulled down.

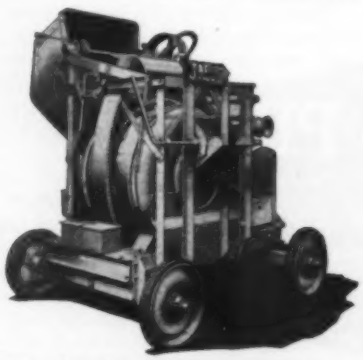
It is further stated that there is no restriction on the way in which these clips are placed on the cable. The clips can be staggered on the cable or placed with the U-bolts all in the same direction, as there are no "circle bends" in the cable from the clips, and the U can be placed over the live cable with as good results as when turned the other way.

A New 7-S Non-Tilt Mixer

THE "Speed Queen" is the name of the new 7-S non-tilt concrete mixer announced by the Jaeger Machine Co., 701 Dublin Avenue, Columbus, Ohio. This mixer is mounted on four wheels and has a spring-hung chassis. The mixing time and time for charge and discharge are the same as for the Speed King, the 1-bag trailer introduced by the Jaeger Co. about a year ago.

The claims for the advantages of the new mixers are longer life for the mixer and a saving of wear on the tires because of the spring-mounted construction. Built of steel, the new mixer has 50 per cent extra strength with a saving of about 1000 pounds in weight. The rollers and countershaft are ball bearing and the steel disc wheels are roller bearing.

The price of the standard model which is stated to be a considerable reduction under the present market includes the Jaeger automatic skip shaker, an accurate-measure water tank and a 2-cylinder LeRoi engine.



The New Jaeger Speed Queen Mixer

A Concrete Pouring Unit Consisting of a 27-E Smith Paver and 40-Foot Tower

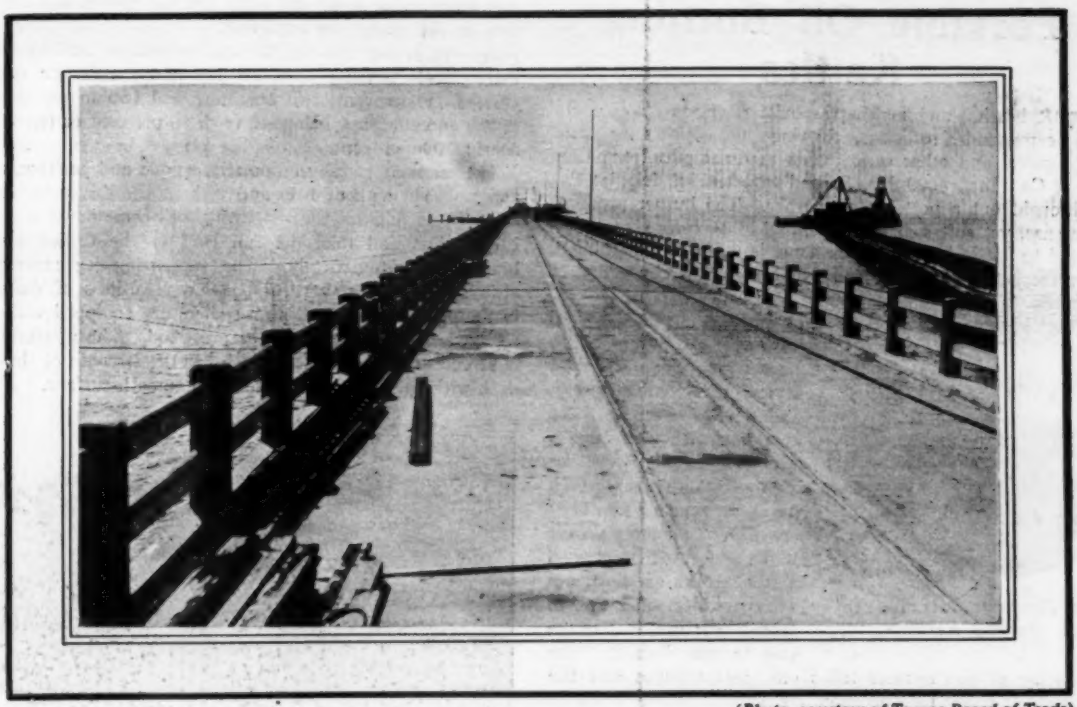
Paver with Tower for Pouring Concrete

A UNIQUE concrete plant was used by the Monarch Engineering Co., of Buffalo, N. Y., to complete a new $1,000,000 pier for the city of Buffalo, in record time. A tower paver, built by the T. L. Smith Co., of Milwaukee, Wis., not only enabled the contractor to pour the concrete over wide areas in a very satisfactory manner, but it also made it possible for him to complete the job one year ahead of schedule.

The contract called for 4,400 feet of wall and two docks each 1,200 feet long with one 100 feet and the other 220 feet wide. The area over which the work was spread made the pouring of concrete a particularly difficult problem. The unit consisted of a standard 27-E Smith paver with boom and bucket removed and a 40-foot tower, elevating bucket, receiving hopper and chuting supported directly on the paver. This equipment combined all the usual advantages of tower and chuting with the advantage of portability. The concrete was actually poured in three months. Similar equipment recently proved useful on large sewer work and also on the recent addition to the Galveston Sea Wall.

Safety First and Human Life

"IF people would only realize that a second's thought might mean the saving of a human life, and the preservation of the happiness that is dependent thereon. Life is a precious gift of Almighty God, and as such should be treasured and preserved to the best of our finite ability. It is upon this bed rock that the safety movement has built its admirable structure. The whole world has responded to the inspiration, and is moving forward with hope and confidence. So you leaders bring forth your thought, give them freedom of action that will bring them into realities, for the world needs them in the form of cooperation."



(Photo, courtesy of Tampa Board of Trade)

The Gandy Bridge, six miles long—lastingly protected against expansion and contraction stresses by Carey Elastite Expansion Joint, installed transversely at frequent intervals.

From Tampa to St. Petersburg —SIX MILES, over Tampa Bay

THE Gandy Bridge, spanning Old Tampa Bay, is the longest auto toll-bridge in the world. Imagine how that six-mile, concrete traffic surface expands and contracts!

But the Gandy Bridge is protected—well protected—against over-stress hazards. Protected by Carey Elastite Expansion Joint, which absorbs the strains and prevents cracking. This remarkable material was used freely, transversely across the concrete floor and up through the hand-rail.

Carey Elastite Expansion Joint is used in bridges, streets, roadways, sidewalks, swimming - pools, culverts, stadiums — wherever concrete is used. It eases strains, absorbs expansion and contraction, protects the concrete against disintegration. Easy to handle, and it keeps its shape in any weather. Write for photographs and information about modern methods of expansion joint installation.

Carey Elastite EXPANSION JOINT

THE PHILIP CAREY COMPANY, *Lockland,* Cincinnati, Ohio

Portable Oil Burning Kettles

FOR heating and melting asphalt, pitch, tar, soft metal compounds, solutions, thawing out hoppers on sand, gravel and other cars, frozen material piles, etc., Connery & Co., Inc., 4000 No. Second Street, Philadelphia, Pa., has brought out a portable oil burner. The burner produces an intense, yet soft soaking flame, and is, therefore, especially adapted to kettle heating. The flame is uniformly distributed under the kettle and many years of life are thereby added to the kettle.

Either kerosene, coal oil or light furnace oil can be used with this oil burner. The burner is made in two styles; the circular burner, and the torch burner. For greater efficiency in using a wood burning kettle, either a circular burner or a torch outfit is suggested. They are simple to operate. After filling the tank with fuel a few strokes of the pump will produce 30 to 50 pounds pressure, forcing the fuel to the burner. The pre-heating of the burners takes only five minutes and the equipment is ready for operation.

The Connery Style B-2 Oil Burning Kettle

The burner is compact and of rugged and sturdy construction. It will withstand constant hard usage. It is well balanced and self-supporting and easily accessible for cleaning. Special oil resisting hose is supplied, together with ground brass unions.

The tanks furnished with the burners are copper brazed, galvanized inside and out in order to make them rust proof. Pressure gage, pump, fittings and valves are of the best materials.

An Automatic Semi-Trailer

DOUBLE capacity, increased operating efficiency and decreased haulage costs are but a few of the many desirable features of the automatic semi-trailers of the Whitehead & Kales Co., Detroit, Mich. The trailers are manufactured to accommodate all the standard makes of light trucks, such as Ford, Chevrolet, Federal, Dodge-Graham, International, Reo, and others in the 1 to 2½-ton field.

The greater part of the load is carried by the trailer axle and wheels. A 1-ton truck with a W&K automatic semi-trailer can pull much greater loads than its rated capacity without straining the motor unit and without any great increase in operating expense. The automatic features protect the motor unit from undue strain and wear, and the upkeep and depreciation on the trailer are negligible.

By employing the shuttle method—three trailers to one motor unit—running costs on the motor unit are only increased 15 per cent, two operators and two motor units are saved, and efficiency increased from 50 per cent or less to very nearly 100 per cent.

The coupling is fully automatic, simple and positive, and is accomplished without help and without the driver leaving the cab. In uncoupling, the supporting legs come down in a vertical position and take the full load of the trailer, and the brakes set automatically. The supporting leg arrangement always maintains a vertical position regardless of differences in the ground level. All semi-trailers are equipped with Web-steel wheels, single or dual, as preferred. The platform deck is of checkered steel plate, which has the strength of the metal deck without the disadvantages of a smooth surface.

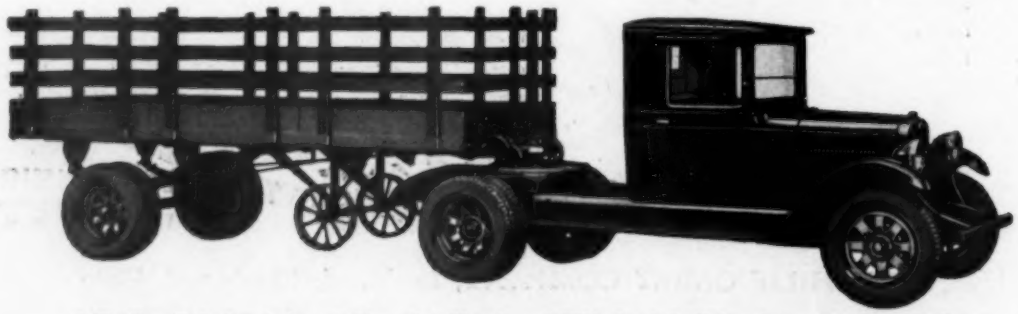
A Blair Bulldozer Mounted on the Model DH Trackson McCormick-Deering Tractor

A 3-Piece Time and Labor Saving Unit

A NEW combination of equipment which is establishing performance records on jobs like backfilling, trench filling, etc., is the McCormick-Deering Industrial 10-20 tractor equipped with Model DH Trackson Full-Crawlers and the Blair bulldozer.

This equipment replaces expensive methods in the filling in of ditches, backfilling, leveling or spreading dumped materials, and filling approaches to bridges, etc. The bulldozer blade is approximately 6 feet wide, and handles a big load of dirt on each trip with the power furnished by the McCormick-Deering motor. The Trackson Full-Crawlers enable the unit to work successfully in soft, loose ground, slippery conditions and other places where it is difficult to get traction. The crawlers grip the ground firmly and enable the tractor to go to the very edge of the fill without danger of slipping in.

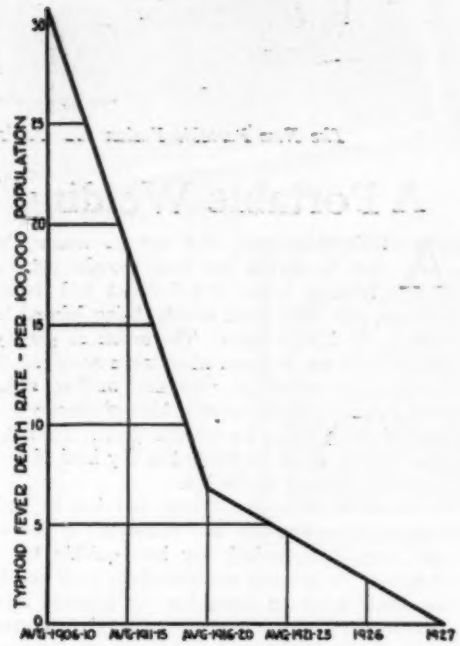
As an economical piece of equipment for use in connection with grading operations where wagons, trailers or trucks are dumping on a fill, this machine will quickly pay for itself in speeding up the dumping and turning time of the hauling units.



A Hauling Unit Consisting of Chevrolet Chassis and Whitehead & Kales Automatic Semi-Trailer

Look at New Haven's Record!

Not A Single Death From Typhoid Fever in 1927



New Haven's Typhoid Record as given by the JOURNAL *of* AMERICAN MEDICAL ASSOCIATION.

Every drop of water delivered by the New Haven Water Company is chlorinated by W&T apparatus. Not only are all chlorinators installed in duplicate to insure against any interruptions in service but a competent sanitary engineer is employed and held responsible for the proper operation of the chlorinating equipment. Such vigilance brings its reward!

THE American Medical Association in its annual typhoid fever survey reports that there was not a single death from typhoid fever in the City of New Haven during 1927.

In commenting upon this, Mr. E. E. Minor, General Manager of the New Haven Water Co., writes: "I want to call your attention to New Haven's enviable record. Much of this is undoubtly due to the chlorination of all our water supplies. Inasmuch as you are wholly responsible for supplying us and in a large part maintaining our chlorination, it seems quite proper that I should call your attention to this so that you may rejoice with us in this fine record which gives us such great satisfaction. In the light of these results, it makes a dollar spent for chlorination seem pretty small. The results are priceless.

"We of course do not take entire credit for this and congratulate our local health authorities as well as ourselves on the record, but without a safe water supply any other effort in this line would of course be fruitless."

"The only safe water is a sterilized water"

WALLACE & TIERNAN

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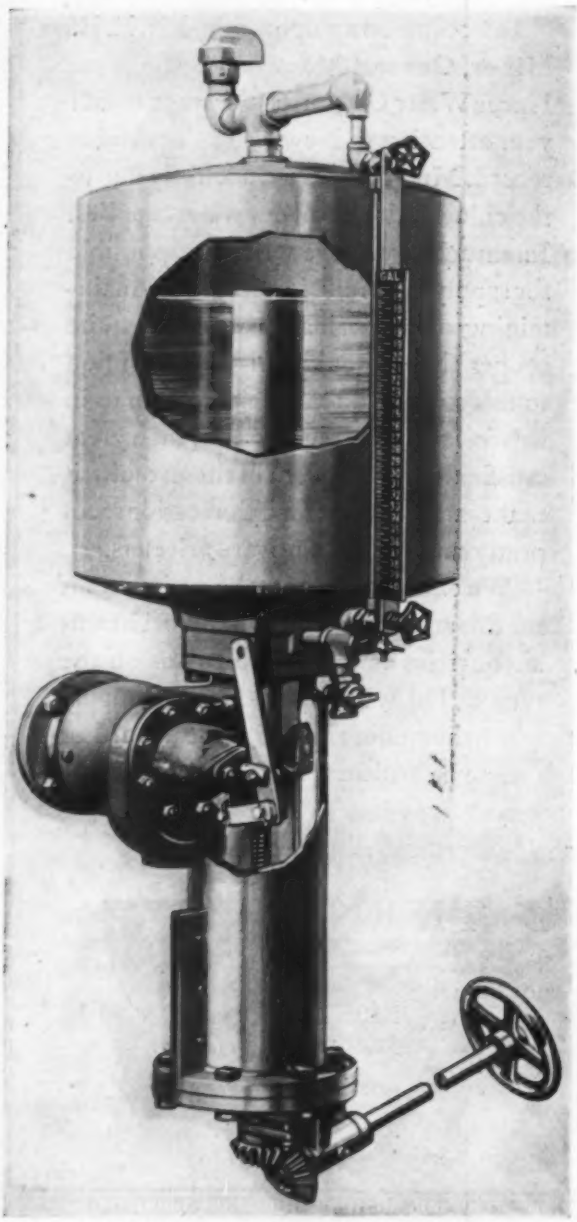
5A 14

New Water Tank for Water Cement Ratio

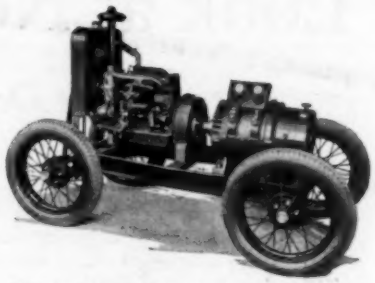
ANTICIPATING the constantly growing use of the water cement ratio for concrete roads and streets, The T. L. Smith Co., 1030 32nd Street, Milwaukee, Wis., is manufacturing a radically different water measuring tank for use on the 1928 Smith paver. The tank is claimed to be accurate to the ounce. The design follows the practice of manufacturers of pumps used in measuring liquids for sale as in gasoline filling stations.

The accuracy of the tank is unaffected with the paver operating on a side or up or down hill slope. The amount of water discharged is varied by raising or lowering a central pipe of large diameter. A convenient hand wheel on the operator's platform permits of regulation to the ounce.



New Smith Water Tank for Water Cement Ratio

The tank and valve are self-cleaning and the regulating parts are non-rusting. The new tank has been furnished on Smith pavers shipped during the current year, with good operating results reported.



The New Portable Fusion Arc Welder

A Portable Welding Unit

A WELDING unit that can be taken wherever a car can be driven has been brought out by the Fusion Welding Corp., 103rd Street and Torrence Avenue, Chicago, Ill. The front wheels, being jointed to the handle, turn as the handle turns. The center of gravity is low, and the unit will not overturn when taken across rough ground. It is especially suited for pipe line welding when the welder must go along, no matter what kind of country is traversed. It is good for jobs in inaccessible places, since it furnishes its own power. It can be hitched to any kind of a car and pulled quickly and easily to the job.

This new gas engine driven unit has an easily controlled welding arc. There is no "vanishing" of the arc no matter how hard it is pushed, nor how quickly the arc length is changed. It instantly accommodates itself to the change and the metal keeps on depositing. A patented method of interpole connections in the generator puts an inherently stabilized current into the welding line and gives the Fuzon welder its arc action. At the same time it makes unnecessary the use of induction coils, reactors, etc.

The single brush shifting control calibrated in amperes gives an infinite number of possible current settings with arc characteristics just as favorable at the lowest as at the highest settings.

Continental motors of ample power—23 horsepower for the 200-ampere and 40 horsepower for the 300-ampere set—guarantee a dependable power supply. An automatic governor keeps the motor speed constant. Less than a gallon of gasoline per hour is used on the 200-ampere set.

Rough Work on the Tamiami Trail

IN the construction of the Tamiami Trail across the hitherto impassable Florida Everglades, where the trail runs through miles of wilderness under water for four months of the year with lime rock lying underground at a depth of 6 inches to 6 feet, Alexander, Ramsay & Kerr, Inc., had to excavate and complete a fill to form the highway foundation. Along the 85 miles of the trail which has been completed a total of 1,297,900 pounds of dynamite was used to dislodge the rock. After all this had been dumped in the fill, the contractors were faced with the task of working miles of jagged boulders and pulverized rock down to a finished grade. This was accomplished through the use of a heavy, powerful Western scarifier-grader, which had been developed for use in the Ozarks and in the mountains of the Far West. With this scarifier-grader the top 12 inches of the fill was speedily reduced to the specified fineness.

Resurfacing Compacted Gravel Roadway
Bowes Road, Elgin Township, Elgin, Illinois

Applying Stanolind Cut-Back Asphalt

Spreading Stone Chips After Applying Cut-Back Asphalt

Dragging Cut-Back Asphalt and Stone Chips to a True Uniform Surface

Stanolind Cut-Back Asphalt

Our publication "Stanolind Cut-Back Asphalt" gives some very interesting data and specifications for surface treatment of roads. Write the nearest Standard Oil Company (Indiana) office for your copy.

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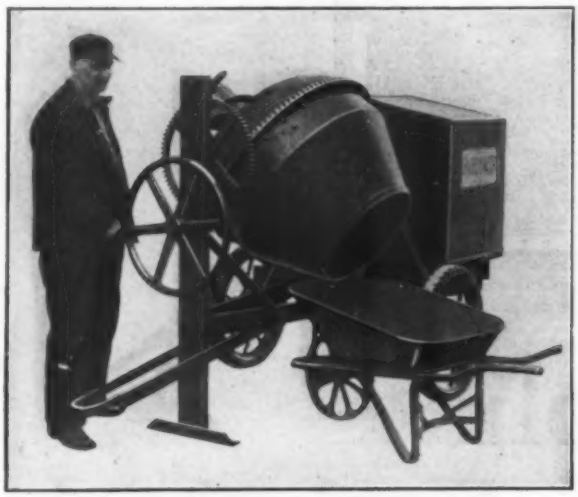
A New 3½-S Trailer-Type Tilting Mixer

A NEW tilting batch mixer of 3½ cubic feet capacity has been announced by the Knickerbocker Co., Jackson, Mich., whose concrete mixers heretofore have been confined to the drum type. The new tilter has been designed to be an easily portable model of relatively small capacity. The drum bottom is a one-piece semi-steel casting to which is bolted a heavy 6-inch steel band. The drum cone is riveted to this band. The 6-inch middle section of the drum secured by this design, together with the shape, number and placement of the paddles, produces a mixing action closely approximating that in the Knickerbocker non-tilting drum-type mixers.

The drum shaft has a bearing area 20 inches long and revolves with the drum. In mixing position the thrust of the load and drum is taken up by a Timken thrust bearing high in the drum head sealed from grit and water. Power is supplied by a 2-horsepower Stover engine and is applied by a malleable pintle chain drive to a sprocket on the main drive shaft. Easy portability is secured by the balance of the outfit and the coil spring mounting over the axle.



The New Knickerbocker Tilting Mixer

A New Gasoline Shovel

THE Victor, a new gasoline shovel, that has incorporated in its design the same characteristics of the Conqueror, has been announced by The Osgood Co., Marion, Ohio. It is, however, a larger machine and designed for greater capacity and heavier work than its contemporary. For shovel service the Victor will carry a 22 or 24-foot boom, a 15 or 16-foot handle, and a 1½ or 1¼-yard dipper, depending on the material to be excavated and the nature of the job. Like the Conqueror the Victor is simple and sturdy in construction, easily maintained and all parts are readily accessible.

For crane or dragline service a structural lattice bow type boom with built-in tagline and with a fair lead for dragline service that is self adjusting to any angle of the boom is furnished. A 45-foot boom with 1¼-yard bucket, or a 50-foot boom with 1-yard bucket may be used.

In changing from one class of service to another, such as shovel to clamshell, back hoe or dragline, no additions or changes are necessary in the operating machinery. The attaching and reeving up of the proper boom assembly and buckets are the only changes necessary. This work may be done in the field in a very short time.

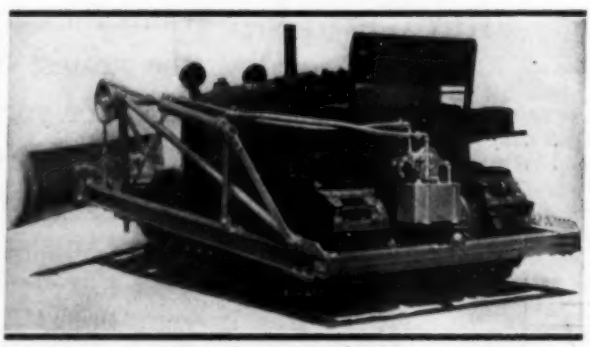
The New Osgood "Victor" Shovel

The combination cast iron gasoline tank and counterweight is mounted on the deck level. The larger size motor is equipped with storage battery, electric starter, voltage regulator, gasoline filter, muffler and air cleaner. The Osgood Servo mechanism for setting the clutches on the hoisting and pull-back drums, and the Osgood application of the wire rope crowd, are used on the Victor. The Servo mechanism makes the motor do the work and relieves the operator of tiresome lever pulls. A touch of one finger is sufficient to make the control levers respond. The hoisting and crowding motions are timed and coordinated so that it is easy to cut to any grade desired. The use of two drums makes it unnecessary to add to the machinery when the shovel is converted to clamshell or dragline.

The Victor is mounted on a truck of new and improved design that is of heavy and rugged yet simple construction It is easy to control and maintain in operation. It has a travel speed of approximately 7/10-mile per hour, and will negotiate grades up to 30 per cent. The truck is designed to give the upper body a suitable mounting for travel over all kinds of material, ranging from rock to mud, and at the same time furnish sufficient locomotive power to enable it to move readily from one point to another.

The continuous tread truck is of the double chain drive type, and is built up entirely of steel castings, with axles and cross travel shaft of hammered steel. The driving clutches are easily disengaged for towing purposes.

The unit has ample deck space all around the machinery and the motor. The control levers are all banked to the left, front side of the machine, where the operator has a full view of his work at all times and has complete control of his machine without leaving his seat.



A Mack Wooldridge Hydraulic Backfiller Attached to a Cletrac "40." This New Equipment Requires Little Machinery to Attach It to the Tractor

Hammers for Driving 2-Inch Wood Sheeting

The Union No. 9 Midget Hammer

DESIGNED to come within the weight range of the pavement breaker and the rock drill type of hammer, and at the same time do more work with less air consumption, the Union Midget hammer size 9 has been produced by the Union Iron Works, Inc., West Shore Siding, Hoboken, N. J.

The Midget hammer is compact, mechanical and of sturdy appearance. It has a symmetrical continuous 100 per cent steel frame. There are no exposed valve mechanisms or working parts, and no rods or gadgets of any kind. There is only one casting on the hammer and that is the piston ring.

This hammer has two self-contained oil reservoirs for cylinder lubrication. There are no oil cups to knock off. A standard ½-inch pneumatic tool hose supplies more than enough air. The hammer is easily operated by one man.

The bottom jaws of this size hammer are set for 2-inch wood, but an extra removable filler piece is supplied so that 3-inch wood sheeting can be driven when the work is within the range of the Midget.

The actual metered air consumption at 90 pounds is 32 cubic feet per minute. The hammer weighs 97 pounds, delivers over 550 blows per minute and strikes a 275-pound blow.

A Pneumatic Drill Built on New Principles

A NEW principle, resulting in lower operating cost, with reduction in weight, eliminating the pressure tank, valves, etc., has been incorporated in the "New-Matic" machine of the Oulton Machine Corp., Bellows Falls, Vt. The new principle consists of drawing free air into the pulsator or compressor cylinder through suitable intake ports at every stroke of the pulsator piston, and expelling it, unobstructed, through a hose into a hammer operating a floating piston within the hammer, and then exhausting. There is no built-up pressure, the drill working on air momentum. Excessive vibration and the possibility of condensation and freezing is eliminated.

The pulsator is double acting, with large and especially designed air ports which open and close on one side of the cylinder, the two hose connections being placed on the opposite side. The top hose is connected with the top of the hammer and bottom hose with the bottom of the hammer.

In operation, the air control or intake mechanism is timed to correspond with the movements of the pulsator piston so as to allow air to be expelled through each hose alternately. The air expelled through the top hose enters the top of the hammer, driving down the floating piston within the hammer, striking the shank of the drill or cutter and then exhausting. The air expelled through the bottom hose enters the bottom of the hammer, returns the floating piston to its original position and clears the chips and dust from the bottom of the drilled hole and then exhausts. At the end of each cycle or operation the air is freely exhausted from the port in the side of the hammer, thus using a fresh charge of air at every stroke.

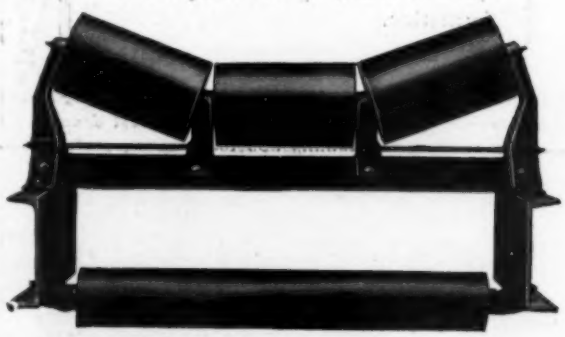
The drill may be operated by a 7-horsepower gas engine or electric motor, drilling a 1¼-inch hole from 4 to 5 feet deep in ordinary builders' granite at the rate of 2 inches per minute. The machine can be built in any required size and for every kind of work wherever it is possible to place the machine within 40 feet of the job. It will not operate with any of the standard pneumatic tools or hammers, but with a special design of the manufacturer, which is valveless. Standard steels, drills, cutters, etc., are used. The maximum pressure is less than 20 pounds, or just sufficient to set the air in motion to operate the special equipment.

A New Belt Conveyor Idler Made of Cast Iron Pipe

A BELT conveyor idler for which the manufacturers claim lifetime service, has recently been announced by the Fairfield Engineering Co., Marion, Ohio, which is building it from designs of Earl D. Stearns. Mr. Stearns recently joined the organization as Vice-president. One of the features of the new roller is the use of deLauvaud cast iron pipe for the roller. This product is a centrifugally cast iron pipe, very dense and close grained and entirely free from blow holes and slag pockets. Due to the uniform wall thickness and trueness to shape, the deLauvaud pipe roller runs true and without vibration. It is also highly resistant to rust or abrasion.

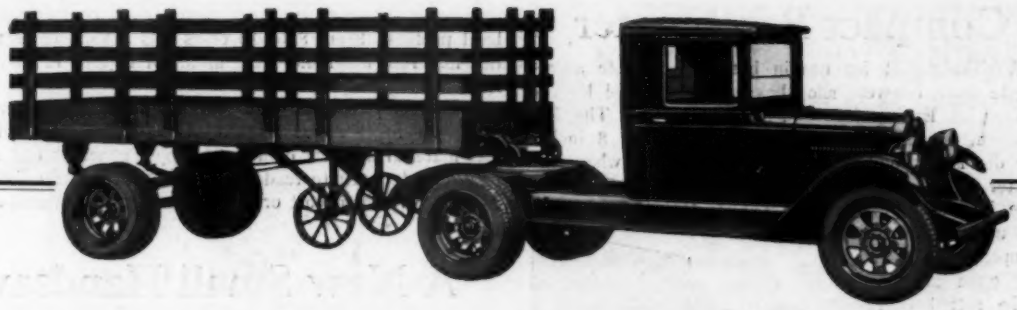
Timken bearings are used throughout and lubrication is of the direct high pressure type. All grease pipes are extended to the end of the supporting frame making the grease connections all easily accessible and eliminating the necessity of reaching under moving belts. Another feature of the lubricating system is the four-pass dust-proof labyrinth grease seal with small diameter exit in the outside washer. As there is no grease pocket outside the grease seal washers, the idler cannot throw grease.

The idler has interchangeable rollers. All rollers on each idler are the same face with ends alike, so that rollers can be inserted between any bracket or turned end for end between the brackets. The bearing adjustment is positive with any degree of fineness and the rollers do not lose adjustment when removed from the brackets. The heavy cast iron brackets which hold the idlers solidly in place are mounted on a self-cleaning angle base. If desired, bases are furnished tilting the idler in the direction of belt travel to insure a true running belt at all times.



The New Stearns-Fairfield Idler

The face of the return roller supports the belt 1½ inches above the bottom flanges of the stringer channels, giving good belt clearance above the supporting frame cross members. Oscillating bearings are not required or used so return rollers can be set to properly train the belt.



A FULLY AUTOMATIC SEMI-TRAILER FOR YOUR LIGHT TRUCKS

By using a W & K Automatic Semi-Trailer, you can convert any of your ton to ton and a half trucks into a unit that will haul a five-ton load.

The W & K job is fully automatic, has its own brakes, couples and uncouples easily; the driver doesn't have to leave his seat. It is equipped with Websteel Wheels, single or dual, as you want.

Write for illustrated circular, and tell us your make of truck.

Whitehead & Kales Co
Detroit Mich

High Lift!

The Star Power Shovel

Dumps 18 feet High at 15-foot Radius—

A Better Performance Than Any Other Skimmer

The Star is a versatile performer, thanks to the *Patented Telescoping Handle*—a grading shovel with all skimmer shovel advantages.

The Star Power Shovel is full-revolving. Handles big yardage in heavy cuts. A fast workers and money-maker on all kinds of jobs.

Skimmer * Grader * Ditcher * Backfiller * Crane

Investigate the merits of the Star. Write today or use the handy coupon.

The Star Drilling Machine Co.

505 Washington St. Akron, Ohio

The Star Drilling Machine Co.
Akron, Ohio

Please send catalog and complete information about the Star Power Shovel.

Name .....

Street Address .....

City ..... State.....

CEM-928

A Compact Batchmeter

A BATCHMETER for use in batching concrete aggregate from concrete silos has been developed by the Superior Engineering Co., Warren, Ohio. The Superior batchmeter requires a height of only 4 feet 8 inches from the discharge point of the bin to the point where the batch meter discharges into the truck. The upper and lower gates are interlocking so that the upper gate cannot be opened while the lower is open and vice versa. In actual operation the Superior batchmeter has operated at 4 to 5 batches per minute. It is particularly adapted for building supply companies, ready-mixed concrete plants and for highway contractors who must save head room, because of conditions at the unloading plant.

The Superior Batchmeter for Circular Bins and Where Headroom Is Low

The capacity of the batchmeter varies from 12½ to 28 cubic feet, and the capacity is changed from below by a chain wheel which operates almost instantly. The capacity gauge is visible from the ground, showing the volume of the batch at all times. The upper gate is of the arc type, measuring 14 x 18 inches square, operated by a chain wheel from the ground through a 12 to 1 gear reduction. The lower gate is of the drop type, measuring 15 x 24 inches, and is operated by the interlocking mechanism from the upper gate, there being no ropes, latches or counterweights. For attachment to a silo or round bin the batchmaker frame is drilled to fit a 40-inch standard Neff and Fry gate frame.

This batchmeter makes possible the use of concrete silos and steel and wood side-discharge bins for concrete plants.

Steel Grit for Core Drill Tests

THE core drill is now in general use by states and larger cities for cutting out test sections of old and new pavements. By its use a cylinder of the paving material is obtained which shows the thickness and character of the material. The State of Ohio operates two outfits and keeps them constantly busy in test work.

The shot drill is usually used for the work. The cutting part is simply a section of pipe with a deep narrow notch in the cutting end. This is revolved in contact with the pavement and steel shot fed to it, doing the cutting.

Recently the Ohio State Highway Department abandoned the use of steel shot in favor of steel grit. The grit is simply crushed steel shot, carefully screened to a standard size. It costs about the same as steel shot, but offers sharp cutting edges, while steel shot are round and smooth. No. 8 grit which just passes an 8-mesh screen is the size usually employed for core drill work.

Extensive use by the Ohio State Highway Department shows that steel grit cuts much faster than steel shot. Shot was always very slow on brick, while with grit it is possible to cut through 2½-inch brick in 7 minutes. Gravel concrete is usually very hard to cut since most gravels contain some very hard pebbles. From 8 to 10 cores was a good day's work in this material, when shot were used. With grit, 12 to 15 cores is an average day's work.

The steel grit feeds well and less is used per core. The American Steel Abrasives Co., Galion, Ohio, manufactures this material and has offered to supply generous test samples of No. 8 steel grit to readers of CONTRACTORS AND ENGINEERS MONTHLY without cost or obligation for experimental and test purposes.

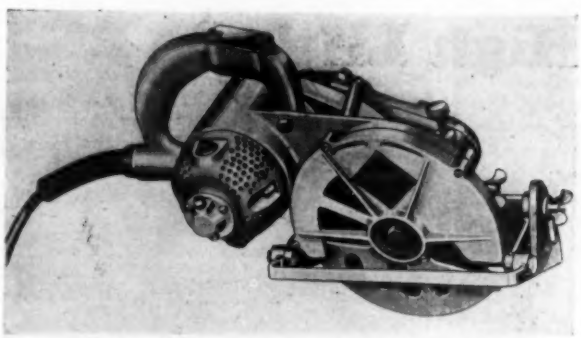
A New Small Handsaw

A NEW small electric handsaw with a cutting capacity of 2 inches, and equipped with a safety guard has been brought out by the Wappat Gear Works, Inc., 7522-26 Meade Street, Pittsburgh, Pa. It requires only one hand to operate and works easily in any position.

The lower guard of the saw is an exclusive patented feature which completely encloses the saw blade, opens gradually by telescoping into the upper guard as the saw is pushed into the material, and immediately snaps shut as the cut is finished, thus affording the maximum of protection to operator and saw blade.

The saw is built in three models; one for plain square cutting; one for bevel cutting; and one with adjustable dado cutter for grooving. On all three models, the shoe is adjustable vertically, making it possible to set the saw to cut any required depth. Because of its adaptability, this saw cuts all kinds of wood, soft metals, Bakelite, fibre and various similar materials.

A high-speed universal motor, fan-cooled, mounted on ball bearings, furnishes the power and shoots a blast of air to the front of the saw, thus clearing the sawdust away and making it possible to follow a line accurately. The saw shaft, mounted on tapered roller bearings, is driven by helical gears which



The New Wappat Electric Handsaw

are mounted on ball bearinigs, all completely enclosed and running in grease. A double-pole non-arc switch is mounted in the handle within easy reach of the operator's forefinger. The frame is all aluminum, highly polished, and all exposed steel parts are rust-proofed. Various parts are made of heat-treated aluminum alloy to retain lightness and obtain maximum strength and durability, which qualities should appeal to contractors.

The Span of Life and Safety

"LIFE has been lengthened by a decade or more through the advancement of science, but the possiblities of lengthening our days and keeping our bodies free from incapacities and sufferings were never so apparent as they are today, if we continue an active interest in the cause of safety. Not only is liberty of action greater than it ever was, but the opportunities and power to exercise that liberty grow more and more each year."

These especially selected catalogs and pamphlets of value to contractors are for free distribution.

BOOKLETS FOR BUSY CONTRACTORS

You will find it worth while to check these lists each month and write for the catalogs you need.

THE HOIST WITH THE EXCLUSIVE BRONZE SCREW

General hoist catalog "D" of The Brown Clutch Co., Sandusky, Ohio, describes and illustrates the Model 20, 2000-pound capacity hoist with 4-cylinder, 15-horsepower Le Roi engine, that has the exclusive bronze screw thrust, that eliminates drilling and slotting the main shaft at the point which stands the greatest strains and hardest shocks.

ROAD ROLLERS FOR ALL CONDITIONS

The up-to-dateness of the Buffalo-Springfield roller that is designed to meet all sorts of conditions and is built in many models and sizes, accounts for the nation-wide popularity of this equipment. It is described in illustrated literature which The Buffalo-Springfield Roller Co., Springfield, Ohio, will send on request.

LOGICAL, LASTING PROTECTION WITH EXPANSION JOINTS

Carey Elastite expansion joint that absorbs expansion and contraction, prevents overstresses in the structure, protects concrete against breakage, and extends its length of service, that will not melt in hot weather, nor become brittle in cold weather, that lasts as long as the concrete, reduces maintenance expenses and is conveniently installed, is described in literature of The Philip Carey Co., Lockland, Cincinnati, Ohio.

THE LAST WORD IN SUBGRADING EQUIPMENT

Formgraders, road rooters, trail graders, test templates, true-grade scarifiers, true-grade planers and other subgrading equipment are described in literature which Ted Carr & Co., 939 North Avenue, Chicago, Ill., will send to interested contractors and engineers on request.

TRACTORS FOR EARTH MOVERS

Caterpillar tractors for earth movers, that enable their owners to put in the low bid and get the job, that can make a good profit on the job, finish it promptly and get another profitable contract, are described in literature of the Caterpillar Tractor Co., San Leandro, Calif.

A COMPRESSOR FOR ALL KINDS OF PNEUMATIC TOOL WORK

The Traylor 12-inch x 10-inch portable compressor of the Cement-Gun Co., Inc., Allentown, Pa., is always ready for the job, will operate five rock drills, 14 chipping hammers, or other pneumatic tools in proportion, and that is the horizontal type, double acting, slow speed, sturdy and reliable with long life and low upkeep, is described in literature of the company.

NO HOT LEAD, NO COLD LEAD WITH THIS PIPE

Labor-saving simplicity and unfailing dependability are the outstanding characteristics of Universal cast iron pipe, that eliminates all jointing materials, that has nothing to deteriorate, nothing to work loose in the flexible machined iron-to-iron joints, can be laid practically anywhere in any season, that requires no tool but a wrench, and that is described in literature of The Central Foundry Co., Graybar Building, 420 Lexington Avenue, New York.

AN INDUSTRIAL TRACTOR

There are thousands of contracting uses for the McCormick-Deering industrial tractor that is compact, flexible, mobile, powerful, versatile, economical and delivers power three ways—through drawbar, belt, or power take-off, or combinations of these. Descriptive literature may be obtained from the International Harvester Co. of America, Inc., 606 So. Michigan Avenue, Chicago, Ill.

BOILERS FOR CONTRACTORS' EQUIPMENT

Johnston Bros., Inc., specializing in boilers for contractors' equipment, with sixty years' boiler building experience, will be glad to send information to interested parties on their boilers, thousands of which are in use in practically every country in the world.

PUMPS THAT MAKE GOOD WHERE OTHERS FAIL

Bulletin 29-C of The LaBour Co., Chicago Heights, Ill., tells all about LaBour centrifugal self-priming pumps that are made in various types and sizes, that hold their prime even when air is admitted at the suction, and that are simple with no diaphragms or internal valves of any kind, and that give 20-foot suction lift at or near sea level.

A NEW ROLLER-BEARING LINE OF MIXERS

The new Republic roller-bearing line of mixers with bigger drums, thicker heads, heavier trucks, higher and wider wheels and simpler construction, short turn trucks, automatic throwout and brake, is described in the latest catalog of the Republic Iron Works, Tecumseh, Mich.

CUT BACK ASPHALT

Stanolind cut back asphalts for every purpose are described in literature of the Standard Oil Co. of Indiana, 910 So. Michigan Avenue, Chicago, Ill., which is available on request.

MORE DIRT PER DOLLAR

More dirt per dollar is the claim of The Parsons Co., Newton, Iowa, for every trench excavating machine which goes out from their factory. Literature describing this machinery will be sent free on request.

A REVOLVING TRACTOR SCRAPER

The Groundhog tractor scraper that revolves to load, spreads and dumps continuously under forward draft, that is a time-saver since the user has absolute control over loading, does not stall nor overload, and is operated by a slight pull on a tsip rope, is described in complete literature of The Roderick Lean Co. Mansfield, Ohio.

A HEAVY-DUTY TRAILER

Rogers heavy-duty trailers that are used for the heaviest jobs of transporting machinery from place to place, are described in complete literature of the Rogers Brothers Corp., Albion, Pa.

A STOPPER FOR ALL KINDS OF PIPES

The Goodman cylindrical stopper for use in gas, oil, water and drain pipes is described in literature of the Safety Gas Main Stopper Co., 523 Atlantic Avenue, Brooklyn, N. Y.

DERRICKS AND WINCHES

The complete line of derricks and winches of the Sasgen Derrick Co., 3101 Grand Avenue, Chicago, Ill., is described in literature of the company, which will be sent to interested parties on request.

CURING CONCRETE ROADS

Booklet 2051 of the Solvay Sales Corp., 40 Rector Street, New York, describes Solvay calcium chloride for curing concrete roads and gives the latest authoritative information regarding the importance of this curing agent in the construction of concrete roads.

ASPHALT PRODUCTS

Standard asphalt products, including asphalt binders, cold patch asphalt, refined asphalt, asphalt joint fillers, paving flux, bridge asphalt and preserving oils of the Standard Oil Co. of New York, 26 Broadway, New York, are described in literature of the company.

DEPENDABLE ENGINES FOR CONSTRUCTION MACHINERY

Stover engines that are Wico-magneto-equipped, that are famous for their inbuilt quality, and that give dependable power for construction jobs, are described in literature of the Stover Manufacturing & Engine Co., 15 Lake Street, Freeport, Ill.

A TRACTOR CRANE

The Tractocrane that is a highly portable unit available with McCormick-Deering or Fordson power unit on rubber-tired wheels, semi- or full-crawler traction, with various attachments, and one-man operation, low initial cost and speed of operation, is described in literature of The Vergan-Schmidt Co., Dubuque, Iowa.

ENGINES FOR ENDURING SERVICE

Waukesha "Ricardo Head" engines that are designed for 24-hour-a-day service, year-in and year-out, and that are rated on continuous operation at moderate r.p.m., are described in literature of the Industrial Equipment Division of the Waukesha Motor Co., Waukesha, Wis.

A FULLY AUTOMATIC SEMI-TRAILER

A fully automatic semi-trailer for light trucks, that combines every known advantage of automatic construction and design, that has a special fifth-wheel construction, its own braking system which operates automatically and independently, and a simple, positive, and automatic coupling, is described in literature of the Whitehead & Kales Co., Detroit, Mich.

ROAD MAINTENANCE EQUIPMENT

Highway officials, supervisors and contractors may obtain from Littleford Brothers, Dept. A, Cincinnati, Ohio, a copy of this company's complete maintenance equipment catalog in which oil burning kettles, wood and coal burning kettles, tool heaters, and dryers, portable tool boxes, grout mixers, etc., are all properly arranged and clearly indexed.

AIR HOISTS WITH NEW FEATURES

Special Publication No. 1667, recently issued by the Chicago Pneumatic Tool Co., 6 East 44th Street, New York, completely describes the new line of CP air hoists with capacities of 2,000, 3,000 and 4,000 pounds, respectively, and with a number of new features.

NEW HAND HOIST AND DUMP BODY

Bulletin H.C. 1, issued by The Heil Co., Milwaukee, Wis., describes this company's hand hoists and bodies, especially outlining the advantages of the Heil hand hoist with Model 90 dump body which is designed to assure positive action with the least operating effort.

KEROSENE BURNER TANK LIKE WHEELBARROW

The Chausse Oil Burner Co., Elkhart, Ind., has announced a new model kerosene torch arranged similarly to a wheelbarrow which will enable the 14-gallon tank, self-contained pump and air pressure gage and kerosene burner to be moved from place to place by one man.

A COMPACT BATCHMETER

The Superior Engineer, Vol. 1, No. 1, issued by the Superior Engineering Co., Warren, Ohio, describes the Superior silo batchmeter which is particularly adapted for building supply companies, ready-mixed concrete plants and for highway contractors who must save head room, as it requires a height of only 4 feet 8 inches from the discharge point of the bin to the point where the batchmeter discharges into the truck.

CURING CONCRETE WITHOUT WATER

Catalog No. 2 recently issued by McEverlast, Inc., 1110 Board of Trade Bldg., Los Angeles, Calif., describes in detail the Hunt Process of curing concrete by the application with a spray gun of McEverlast Paving Special which prevents the evaporation of the original mixing water by sealing the surface of the concrete.

NEW NON-TILT MIXER

Complete information regarding the Speed Queen, a new 7-S non-tilt concrete mixer mounted on four wheels and with a spring-hung chassis, may be secured from the Jaeger Machine Co., 701 Dublin Avenue, Columbus, Ohio.

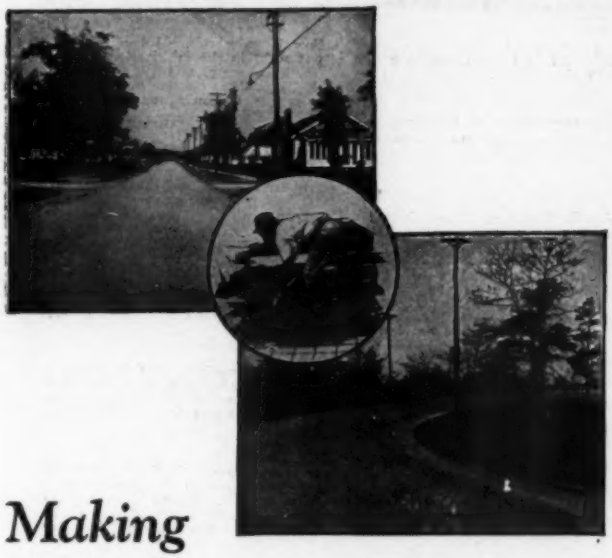
WELDED INDUSTRIAL PIPING

Copies of the new booklet "Oxwelded Industrial Piping" describing and explaining economies in construction, repair and maintenance of oxwelded pipe systems may be obtained on request from the Linde Air Products Co., Room 401, 30 East 42nd Street, New York, N. Y.

American Steel & Wire
Company's

WIRE FABRIC

"The Steel Backbone for Concrete"



Making City Street and Country Highway Permanent

TO reinforce concrete roads with Wire Fabric makes them permanent and is a proven economy. This fact is conclusively brought out in the report of the Highway Research Board, National Research Council.

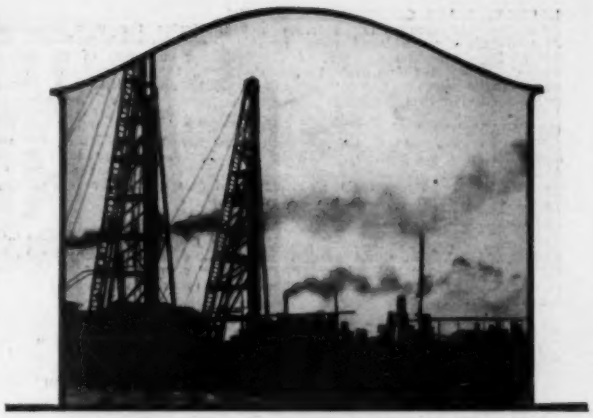
Made of cold drawn high tensile strength steel, Wire Fabric has proved itself the perfect slab reinforcement. It gives the most effective distribution of steel—the closely spaced wires insuring greatest binding strength, holding the slab together as a solid unit and preventing the development of cracks.

Wire Fabric means permanent reinforcement—longer concrete life—lower maintenance costs. It is furnished in sheets cut to definite size which are easily handled and placed.

SALES OFFICES:

CHICAGO	208 So. La Salle Street	NEW YORK	30 Church Street
CLEVELAND	Rockefeller Building	BOSTON	Statler Bldg
DETROIT	Foot of First Street	PITTSBURGH	Frick Building
CINCINNATI	Union Trust Building	PHILADELPHIA	Widener Building
MINNEAPOLIS—ST. PAUL	Merchants Nat'l Bank Bldg., St. Paul	ATLANTA	101 Marietta Street
ST. LOUIS	506 Olive Street	WORCESTER	94 Grove Street
KANSAS CITY	417 Grand Avenue	BALTIMORE	32 So. Charles Street
OKLAHOMA CITY	First Nat'l Bank Bldg.	BUFFALO	670 Ellicott Street
BIRMINGHAM	Brown-Marx Bldg.	WILKES-BARRE	Miners Bank Bldg.
MEMPHIS	Union and Planters Bank Bldg.	*SAN FRANCISCO	Russ Bldg.
DALLAS	Praetorian Building	*LOS ANGELES	2057 E. Slauson Ave.
DENVER	First National Bank Bldg.	*PORTLAND	777 Nicolai Street
SALT LAKE CITY	Walker Bank Bldg.	*SEATTLE	4th Ave. So., & Conn. St.

United States Steel Products Company.



Lidgerwood Hoists

help drive 12,000 piles in record time

Merritt-Chapman & Scott Corporation is using Lidgerwood Hoists on the Baltimore, Md., pier job. This contract calls for driving approximately 12,000 piles each 80 to 95 feet in length. The driving is exceptionally difficult, yet the two machines drive from 120 to 150 piles per day, working two ten-hour shifts.

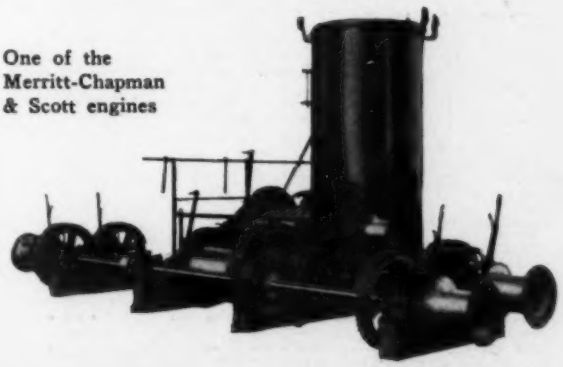
Not only is this unusual in the average number of piles driven daily—probably a record—but, we are told, this is the largest order for piles ever placed on the Pacific Coast for Atlantic Coast delivery. The piles are brought through the Panama Canal on the decks of steamers.

Your hoisting dollar does its utmost *when you buy Lidgerwoods.*

Lidgerwood Manufacturing Company

ELIZABETH, NEW JERSEY

One of the Merritt-Chapman & Scott engines



IMPROVED AIR COMPRESSOR VALVE

Bulletin 138 completely describes and illustrates the new improved Pennsylvania air cushioned valve for air compressors which is the result of long study on the part of the designing engineers of the Pennsylvania Pump & Compressor Co., Easton, Pa., to produce an air valve which would combine the utmost of durability and efficiency with the greatest element of safety.

GAS WELDING AND CUTTING EQUIPMENT

The Oxweld Acetylene Co., 30 East 42nd Street, New York, has recently issued a new catalog which describes in detail the products manufactured by this company, including welding and cutting equipment of all sorts and generators for the production of acetylene. Free copies may be secured from the company on request.

BUILT FOR SERVICE

The new "Built for Service" crawler crane Book No. 995 of the Link-Belt Co., 300 W. Pershing Road, Chicago, Ill., covers the complete Link-Belt line of gasoline, diesel and electric crawler cranes of capacities up to and including the 2-cubic-yard heavy-duty machine as well as standard locomotive cranes.

A NEW CONCRETE BREAKER

The K-3 Buster of the Sullivan Machinery Co., 162 S. Michigan Avenue, Chicago, Ill., is a powerful and substantial compressed air tool for concrete breaking of the heaviest and most difficult kinds. It weighs 84 pounds, is strong and sturdy yet unusually easy to handle, and runs smoothly with little vibration. It is described completely in Bulletiin No. 81-U which is available on request.

A STEEL BACKBONE FOR CONCRETE

Wire fabric for reinforcing concrete roads, making them permanent as well as economical, that is made of cold drawn high tensile strength steel, giving the most effective distribution of steel by the closely spaced wires that hold the concrete slab together as a solid unit and preventing the development of cracks, is described in literature of The American Steel & Wire Co., 208 S. La Salle Street, Chicago, Ill .

NEW CABLE CLIP WITH GROOVED JAWS

A descriptive folder on a new cable clip with a larger grooved holding surface and which is made in all sizes of steel or bronze and sold by the manufacturer with an absolute guarantee of satisfaction to the user, may be obtained from the Eureka Metal Products Corp., North East, Pa.

NEW TRAILER TYPE TILTING MIXER

A new tilting batch mixer of 3½ cubic feet capacity has been announced by the Knickerbocker Co., Jackson, Mich., and is described in an illustrated folder which may be secured on request.

PORTABLE PUMPS

Barton portable pumps that are direct-driven by car or truck, automatically primed, low priced, that will do all kinds of pumping, will save you time and money, and that require no separate engine, are described in literature of of the American Steam Pump Co., Battle Creek, Mich. These pumps are built in five sizes.

SELF LOADING SCRAPERS

With a pay-roll of only two or three men, you can move as high as 500 to 600 yards of dirt a day with a full train of self-loading scrapers of The Baker Manufacturing Co., 585 Stanford Avenue, Springfield, Ill., that are powerful, easily operated, short turning, practical excavators with a long and successful record, and are described in Bulletin No. 251 of that company.

ROAD PUMPS FOR CONTINUOUS SERVICE

Literature of The Barnes Manufacturing Co., 905 Main Street, Mansfield, Ohio, describes Barnes Triplex road pumps that have a most simple self-oiling system with one moving part rotary pump, all steel gears, forged crank shaft, 3-point suspension truck, roller bearings on all shafts, water cylinders detachable from power end, and many other desirable features.

NEW WATER TANK FOR WATER CEMENT RATIO

The T. L. Smith Co., 1030 32nd Street, Milwaukee, Wis., is manufacturing a radically different water measuring tank for use on the 1928 Smith paver, that is claimed to be accurate to the ounce, is unaffected with the paver operating on a side or up or down hill slope, and is described in literature of the company.

FOR ROAD CONSTRUCTION REPAIR AND MAINTENANCE

Tarvia, the well-known material for road construction repair and maintenance, the use of which results in smooth and long wearing roads, is described in a descriptive booklet of The Barrett Co., 40 Rector Street, New York, which will be sent on request.

PAPER BAGS FOR SERVICE

Bates Multi-Wall paper bags that have 5-walled resistance to moisture, and that enable you to store material anywhere, in any weather, and have it safe from moisture, preventing loss, are described in literature of the Bates Valve Bag Co., 35 East Wacker Drive, Chicago, Ill.

A FAST ONE-MAN CONVERTIBLE TRACTOR SHOVEL

Bulletin T-4 of the Bay City Dredge Works, Bay City, Mich., reproduces many letters from contractors and highway boards praising the tractor shovel of that company, and also shows possibilities for economy on all kinds of work, as a trencher, crane, dragline or shovel. It is available to interested contractors and engineers.

RELIABLE HOISTING BLOCKS

Star brand hoisting blocks of the Boston & Lockport Block Co., East Boston, Mass., are always reliable, made for every condition of service and sold by the leading supply houses. The company will be glad to help you with your hoisting problems, and will send descriptive literature to interested parties on request.

MAN'S-SIZE DRAGLINES FOR MAN'S-SIZE JOBS

Reliability and one standard of quality are the outstanding features of the many machines of the Bucyrus-Erie Co., South Milwaukee, Wis., that enable you to clean up the job in record time by their big output and efficiency and give you low-cost yardage. Literature describing these machines will be sent to interested contractors and engineers on request.

AIR COMPRESSORS IN VARIOUS TYPES

A variety of types and sizes to meet every portable compressor demand, including the Buhl type "Y" furnished in 115- and 160-foot displacement, is described in a bulletin of The Buhl Co., 405 S. Dearborn Street, Chicago, Ill.

UNLOADERS AND SPREADERS

The superior qualities of Burch unloaders and spreaders recommend them to contractors for the heaviest and most difficult jobs. A complete catalog giving full particulars and data will be sent interested parties by The Burch Corp., Crestline, Ohio.

POWER AND HAND BLOCK MACHINES

National concrete block machinery for hand and power operation, and for every size plant, that gives high production at low cost, is described in literature which the Cement Block Machinery Co., 17 Durand Street, Newark, N. J., will be glad to send on request.

A ROAD BUILDERS' PUMP

The "Giant" pump of the Domestic Engine & Pump Co., N. Queen Street & P. R. R., Shippensburg, Pa., is a self-oiling Triplex pump in capacities of 60, 80, 100 and 150 big, steady gallons per minute, at pressures up to 500 pounds. It is described in a special descriptive booklet that the company will send on request.

HOW TO CURE CONCRETE

This is the title of a book of The Dow Chemical Co., Midland, Mich., which tells all about Dowflake that is put right in the mixer, doing away with the extra labor and expense of earth covering, and resulting in a faster-setting, more uniformly cured slab. It makes concrete more plastic, easier to spread and finish, and reduces the tendency toward surface cleavage, voids and pitting.

AGGREMETERS BUILT FOR STRENGTH

Erie aggrementers of the Erie Steel Construction Co., Erie, Pa., that are built with a great ratio of strength, thus giving ample construction to carry a heavy overload, that are as easily transported and erected as any make of bins of 75 to 216 tons capacity, and have self-cleaning bins, are described in a special catalog of the company, which you should write for today.

ROAD BUILDING EQUIPMENT

Complete information will be sent by The Euclid Crane & Hoist Co., Euclid, Ohio, describing the Euclid line of heavy-duty wheel scrapers, rotary fresnos and all-steel tractor-drawn dump wagons, that move earth quickly and economically, and are built to withstand the most severe strains imposed by the heaviest tractors.

GASOLINE AND DIESEL LOCOMOTIVES

The Plymouth line of gasoline and diesel locomotives, that is complete from 2-ton to 50-ton sizes, each unit being sturdy, rugged, trustworthy and economical, is described completely in literature of the Plymouth Locomotive Works of The Fate-Root-Heath Co., 263 Riggs Avenue, Plymouth, Ohio.

A 2-SPEED HOIST

Instantaneous change of speed on the front drum with the load on the drum without stopping motor or hoist is possible with the 2-speed hoist of the S. Flory Manufacturing Co., Bangor, Pa., where, especially in quarry operations and slack line excavations, this means more work every day and more profits to its users. A bulletin of the company describes this hoist and will be sent on request.

A BUCKET TO FIT EACH JOB

The Hayward line of buckets, including clamshell, orange peel, dragline and electric motor buckets, as well as dredging, excavating and coal handling machinery, automatic take-up reels, and counter-weight drums, are described in literature of The Hayward Co., 32-36 Dey Street, New York.

TRAILERS FOR HIGHWAY JOBS

Highway machinery trailers that can earn you money by economically and quickly transporting materials and machines from one job to another, are described in literature of the Highway Trailer Co., Edgerton, Wis.

WELL DRILLS AND EXCAVATORS

A light, gas drive, traction shovel, useable with three different interchangeable scoops—skimmer, ditcher and clamshell—for road grading, trenching, back-filling, cellar digging, pit mining, loading, unloading and handling materials, that is crawler-mounted, steam or electric power operated, as well as other excavators and well drills, are described in literature of the Keystone Driller Co., Beaver Falls, Pa.

CLAMSHELL BUCKETS

Clamshell buckets of Joseph F. Kiesler Co., 936 West Huron Street, Chicago, Ill., that are the result of 35 years of specialized manufacture, and have patented features, are guaranteed in operation, durable and simple, and in use all over the country, are completely described in literature which that company will be glad to send on request.

A REMIXING ACTION

Paver Catalog P-6 of the Koehring Co., Milwaukee, Wis., tells all about the remixing action of Koehring mixers, that prevents separation of aggregate according to size, returns material back to the charging side for repeated trips through the mixing process, and gives dominant strength concrete, uniform to the last shovelful of every batch.

A NEW ELEVATING GRADER

Strength is the outstanding feature in the new "Contractor's Special" elevating grader of The Austin-Western Road Machinery Co., 400 N. Michigan Avenue, Chicago, Ill., that has all the regular features of the graders of this company as well as several unique features. It is described in an illustrated circular of the company.

A FULL-REVOLVING CRANE-SHOVEL

A full-revolving Bear Cat crane-shovel of ¾-cubic-yard capacity, of The Byers Machine Co., Ravenna, Ohio, marks further progress in the combination of light weight with flexibility. It is thoroughly described in a booklet entitled "Byers Whirly Bear Cat."

A FULL-REVOLVING EXCAVATOR

A new full-revolving excavator, Type 4, with five attachments and many new and valuable features, is described in literature which the Insley Manufacturing Co., Indianapolis, Ind., will be glad to send on request.

A PORTABLE WELDING UNIT

A welding unit that can be taken wherever a car can be driven, that is especially suited for pipe line welding and inaccessible places since it furnishes its own power, that can be hitched to any kind of car and pulled quickly and easily to the job, and that has a Continental motor of ample power, is described in literature of the Fusion Welding Corp., 103rd Street and Torrence Avenue, Chicago, Ill.